

UNIVERSITY OF TAMPERE
Faculty of Management and Business

THE ROLE OF INTERACTIVE MARKETING IN IOT-BASED SMART CITY ECOSYSTEMS

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TABLE OF CONTENTS

1. INTRODUCTION	1
1.1 Background of the study	1
1.2 Research problem and objectives	3
1.3 Structure of the thesis	5
2. SMART IOT-BASED URBAN PLANNING	6
2.1 Identifying key concepts.....	7
2.1.1 Urban planning.....	7
2.1.2 Smart cities.....	8
2.1.3 Internet of Things.....	9
2.2 Why do we need smart cities?	11
2.2.1 IoT-based smart cities	12
2.2.2 IoT-based smart city ecosystem.....	13
2.3 Criticism and challenges of smart cities	15
3. INTERACTIVE MARKETING AND VALUE CREATION IN BUSINESS ECOSYSTEMS.....	17
3.1 Identifying key concepts.....	17
3.1.1 Marketing	17
3.1.2 Business-to-business	18
3.1.3 Business ecosystems	19
3.2 Business marketing.....	20
3.2.1 Business market and customers	21
3.2.2 Changes in business marketing	22
3.3 Value creation in business ecosystems.....	24
3.3.1 Value	25
3.3.2 Value co-creation in IoT-ecosystems.....	26
3.4 Direct marketing	28
3.4.1 Digital marketing	30
3.4.2 Interactive marketing	32
4. EXECUTING THE RESEARCH.....	36
4.1 Data collection	37
4.2 Data analysis methods	39
4.3 Case study: Wirepas Oy	41
5. DATA ANALYSIS.....	43
5.1 The role of IoT in smart cities	43
5.2 Value co-creation in IoT-based smart city ecosystems	47
5.3 Marketing in IoT-based smart city ecosystems	49
6. DISCUSSION.....	54
6.1 Smart cities – IoT-technologies increasing inhabitants wellbeing in urban areas.....	54
6.2 A complete IoT-solution needs all parts of the value chain	56

6.3 The core of business marketing is human-to-human contact	61
7. CONCLUSIONS	65
7.1 Thesis summary and practical implications.....	65
7.2 Limitations of the study	68
7.3 Suggestions for further research	68
BIBLIOGRAPHY.....	70

LIST OF FIGURES

Figure 1: The theoretical framework of the thesis	6
Figure 2: IoT ecosystem in smart city context (Mukti & Prambudia 2018, 5).....	15
Figure 3: Online marketing domains (Kotler & Armstrong 2010, 529).....	31
Figure 4: Interconnections between Interactive Marketing, Direct Marketing and Digital Marketing.....	36
Figure 5: Smart city IoT ecosystem of Wirepas Oy	57
Figure 6: Wirepas smart city ecosystem (adjusted from Mukti & Prambudia 2018, 5).	58
Figure 7: IoT-based smart city ecosystem	60

LIST OF TABLES

Table 1: Four levels of interactivity (Ryan 2004, 11).....	33
Table 2: Interactive marketing techniques (Barwise & Farley 2005, 73).....	35
Table 3: B2B marketing channels in the IoT industry	51
Table 4: B2B marketing techniques evaluated based on their importance in IoT industry	52
Table 5: Interactive marketing techniques evaluated based on their importance in the IoT industry and level of interactivity	63

ABSTRACT

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This thesis focuses on IoT-based smart city ecosystems and interactive marketing. The objective of this study is to find out what is the role of interactive marketing in IoT ecosystems around smart cities, by first finding out what is the role of IoT in smart cities and who are the players in IoT-based smart city ecosystems. In this qualitative case study, the empirical data is gathered by interviewing eight IoT professionals, both from the private and public sector. The researched subject of this thesis is the smart city ecosystem of Tampere based software company Wirepas Oy.

In smart cities, devices are monitored, controlled and managed remotely. The focus in IoT-based smart cities is in gathering real-time data and utilizing the data to plan preventive maintenance activities, optimizing cities' resources, saving cost, energy, gas, and water and to make citizens happier and ease their lives in urban areas. To be able to deliver these smart solutions to cities, IoT business ecosystem needs to be in place. The IoT business ecosystem is a complex value chain where all the actors of the network are needed to deliver superior value for the end user, cities and citizens.

In order to build and grow these ecosystems, efficient marketing tactics need to be utilized. In this thesis, interactive marketing as a modern form of direct marketing is researched. The key feature of interactive marketing is a two-way conversation between the company and its targeted customers, and it is based on participatory activities of customers. This thesis focuses on commonly used marketing techniques in one IoT business ecosystem and evaluates the techniques based on their importance and level of interactivity.

This thesis shows that the concept of smart cities can be defined as a citizen-centered approach where IoT technologies are enablers of new, smart solutions. The thesis presents interactive marketing as an important marketing tool in building IoT ecosystems which are the enablers of smart cities. The thesis shows, that without these IoT ecosystems consisting of companies, each bringing their own value to the ecosystem, smart city solutions cannot be developed.

1. INTRODUCTION

1.1 Background of the study

Smart cities have been in the center of focus in urban planning research for many years now, and there are numbers of academic papers written about the theme. The role of Internet-of-Things (IoT) in smart urban planning is an actively discussed topical theme all around the world today, and the amount of IoT-companies is currently growing rapidly. In smart cities, devices are monitored, controlled and managed remotely. A smart city is a city that can plan its preventive maintenance activities and optimize its resource while maximizing services to its citizens. In smart cities, data is collected real-time and city management can, for example, predict a water main break or water pollution with the help of technology. (Hall 2000, 1; Kim et al. 2017, 259.)

IoT-based smart cities are the result of utilizing modern technologies in urban planning. In an IoT-based smart city, devices are linked to each other and the Internet for fast accessibility. IoT-based smart cities are cities that use modern IoT-technologies bringing a number of benefits in the management and optimization of traditional public services. (Rathore et al. 2016, 65; Zanella et al. 2014, 22-23.)

A smart city is not only a government driven development process - it is “massive interaction between numbers of stakeholders, components, services, and technologies”, states Mukti & Prambudia (2018, 5). Smart city ecosystem consists of actors that are working together towards developing smart cities. These actors are citizens, companies, organizations and city managers. (Abellá-García et al. 2015, 1075.) Even though the government is usually the authority in the development process of urban cities, it is the private sector that is responsible for implementation (MacLaran 2014, 3). In this thesis, the focus is on private sector companies that are playing a significant role in smart urban planning. More specifically, the focus is on the IoT-ecosystems from the perspective of smart cities and companies operating in the ecosystems.

In order to grow the ecosystem, companies need to grow. It enables them to compete more efficiently, satisfy their stakeholders and attract talented workforce. According to Kotler and Armstrong (2010, 67), “marketing has the main responsibility for achieving profitable growth for the company”. Efficient marketing tactics need to be used and the right marketing strategy needs to be in place. Kotler and Armstrong (2010, 28) define marketing as follows: “Marketing is managing profitable customer relationships”. Marketing is more than selling and advertising, it is satisfying customer needs. It is a process by which value is created to customers and strong customer relationships are built. (Kotler & Armstrong 2010, 28-29; 67.)

There are differences between business-to-business (B2B) and business-to-consumer (B2C) marketing strategies. There is more and more discussion about how B2C marketing is one step ahead compared to B2B in marketing, especially in digital marketing, and how B2B companies should utilize more B2C tactics. There is a large number of researches made on business marketing, but traditionally these papers see B2B and B2C customers as totally different characters. Therefore, these papers are arguing that also marketing in B2B and B2C needs to be different. This research challenges the common assumption of business and consumer marketing being different in as many ways as literature has traditionally presented.

Interactive marketing, often referred as digital or online marketing, can be seen as a modern form of direct marketing. Interactive marketing was traditionally seen as a B2C marketing strategy, but some of the recent academic papers and business discussions have included also the business marketing view into interactive marketing research. Several academic papers comparing B2B and B2C customers and marketing (e.g. Hadjikhani & LaPlaca 2013; Iankova et al. 2018) can be found, and some of them (e.g. Gummeson & Polese 2009; Kemp et al. 2018, Pandey & Mookerjee 2018) are highlighting the fact that there are things that business marketers should learn from consumer marketers. Even though the theme has been widely discussed during the past few years, none of these papers are taking the ecosystem view into consideration when researching how interactive marketing works in the business environment.

This research combines two aspects that have gained wide attention in business and academic discussion in the past few years: the role of IoT in smart cities, and the role of interactive marketing in business marketing strategies. The new contribution to business marketing literature is viewing the phenomenon through the lenses of ecosystem thinking. A deep look into interactive marketing as a modern way of executing direct marketing is taken and it is researched how interactive marketing methods could address the needs of B2B customers and partners in IoT ecosystems.

1.2 Research problem and objectives

This thesis focuses on the role of interactive marketing in the building of an ecosystem that works together towards the common goal of making cities and the world smarter, by focusing on certain parts of IoT-ecosystems. More specifically, in business-to-business companies that are working as key players in smart urban planning. Firstly, this thesis focuses on the role of IoT in smart urban planning through IoT-based smart city ecosystems. Secondly, what is the role of interactive marketing in attracting customers and partners in these company ecosystems will be researched. Putting these two aspects together, it can be examined how interactive marketing can be a contributor in building smart cities by helping the smart city ecosystem to grow. As a result of this thesis, a list of marketing techniques that will fuel the growth of the smart, connected world by growing the IoT-based smart city ecosystems, is presented. Another result of this thesis is an IoT-based smart city ecosystem model which is built based on the empirical data presented later in this thesis.

It is researched whether the methods of interactive marketing are applicable for business marketing and what is the role of it in attracting customers and building an ecosystem in this particular area of business. More specifically, which are the best tactics to reach B2B audience in IoT industry. This thesis aims to find out how interactive marketing can be a contributor in making cities and the world smarter by applying its tactics to business marketing in an IoT-company. Therefore, the role of IoT in smart urban planning is also clarified.

A Finnish IoT-software company Wirepas Oy and its ecosystem is used as a case example in this thesis. Wirepas is a company providing a software protocol Wirepas Mesh, that can be used as a connectivity solution to build smart and green cities by optimizing, for example, the consumption of electricity, water, and gas. Wirepas is a significant player in enabling connected smart lighting in cities and buildings, and also in asset and people tracking for various use cases. Wirepas has a large partner ecosystem of companies that are key factors enabling smart urban development.

In this qualitative case study, the empirical data is gathered by interviewing eight IoT professionals: three employees and five customers and partners of Wirepas. The theoretical framework is built by the author reading academic books and papers about IoT-based smart cities, business ecosystems and business- and interactive marketing. In the end, the information gathered through the literature review and the analysis of the empirical data is combined to gain a wider understanding what are the key marketing tactics that are speeding up the growth of the ecosystem and the development of smart, connected cities.

Different business models can have a significant impact on how certain product or service, whether in B2B or B2C, is marketed and branded. The business model of the case company studied in this thesis is based on licensing – Wirepas is licensing the software to their customers, so the customers are not purchasing any physical products directly from the case company. Combining the business model perspective into the study of marketing tactics in IoT-companies would end up the study having an overly wide scope. Therefore, the business model aspect will not be covered in this thesis.

A smart city ecosystem consists of citizens, companies, organizations and city managers (Abellá-García et al. 2015, 1075). In this thesis, the scope is narrowed to cooperating companies and their customers. However, it needs to be noted that in this particular case, the end customers are cities. Different smart city ecosystem players will be introduced, but the thesis is focusing especially on companies as main players. As Abella et al. (2015), Albino et al. (2015), Anttiroiko et al. (2014), Kim et al. (2017), Neirotti et al. (2014) and Nam & Pardo (2011) are stating, human capital is another dimension of smart cities, and it is as important as technology.

This study is recognizing both of the dimensions, but a strong focus is on private companies enabling the technology to be used in developing smart cities.

The research problem in this thesis is: *what is the role of interactive marketing in IoT ecosystems around smart cities?* The questions this paper is answering are:

1. How can IoT make cities smarter?
2. Who are the players in an IoT-based smart city ecosystem?
3. How do different actors contribute to value co-creation in IoT ecosystems?
4. Which are the tactics to reach B2B audience in IoT industry?

1.3 Structure of the thesis

This thesis consists of seven main parts. In the introduction section, the background of the study is explained, specifying the general importance of this thesis and giving a quick look to the theoretical framework with arguments and clarification why these theoretical concepts are essential in this thesis. The research problem and questions are introduced to clarify the objectives of this thesis. In the second chapter, the first part of the theoretical framework is explained, and the relevant concepts related to IoT-based smart city ecosystems and their connections to the concept, are defined. A short look into the history of urban planning is introduced, to provide a background for the development of smart cities. The theoretical framework as a whole consists of IoT and smart cities, business ecosystems and marketing. Therefore, the third chapter is about introducing the marketing part of the theoretical framework by clarifying what direct, digital and interactive marketing are and how marketing is executed in B2B companies. Figure 2 summarizes the key themes used as the theoretical framework of this thesis and the interrelations between the concepts with the research questions.

The fourth chapter focuses on executing the research itself. It will begin by pointing out the research method used, and the ways the empirical data is gathered and analyzed. It is also explained why the writer came to the conclusion of choosing the method that is used in the thesis. After clarifying the research methods used and the collection of the empirical data, a short introduction on the case company, Wirepas Oy, is given.

In the fifth part, the empirical data is analyzed. Citations will be used when analyzing the data to give a realistic vision of how the asked questions were answered by

the interviewees. The last two chapters state the final results of this thesis and show the conclusions made by the writer. As a result of this thesis, a list of efficient interactive B2B marketing techniques that will fuel the growth of the smart, connected world by helping the IoT-based smart city ecosystem to grow, is presented. The results are presented as guidelines for smart city ecosystem players, more specifically the ones operating in the area of IoT. Other results of this thesis can be used to gain a wider understanding of how the IoT is changing cities and what kind of possibilities it is providing in smart urban planning. Other results can be used to widen the understanding of business ecosystems in the technology industry especially.

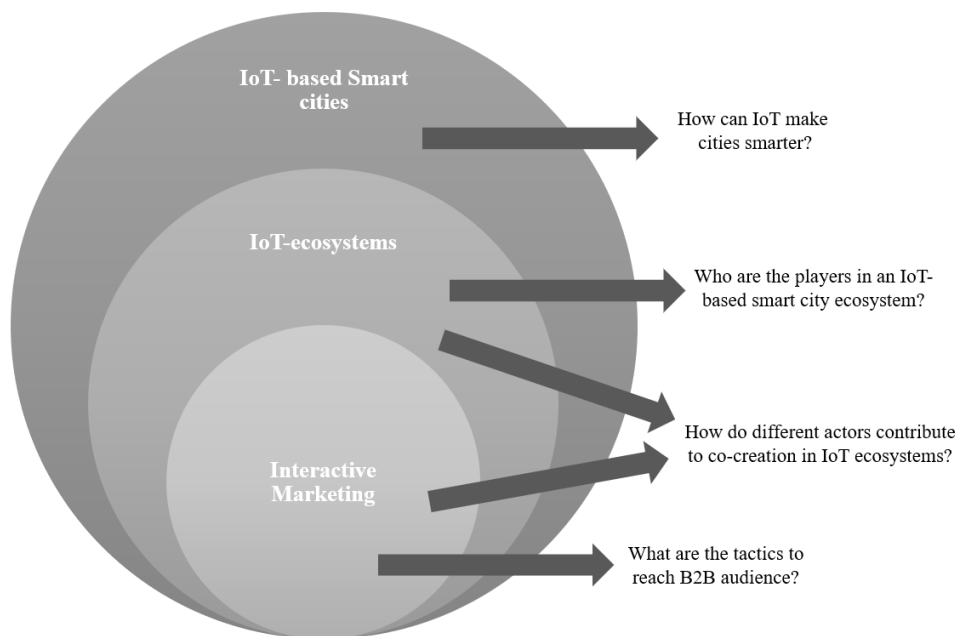


Figure 1: The theoretical framework of the thesis

2. SMART IOT-BASED URBAN PLANNING

To be able to understand the researched phenomenon in more detail, this chapter starts by identifying the concepts of urban planning, smart cities, and the Internet of Things (IoT). The meaning of urban planning is clarified in order to give background information for developing smart cities, after which the concept of IoT-based smart cities as a way of implementing urban planning is defined. After the

definitions for the concepts are given, a short review of the history of urban planning is made to provide a wider understanding of how urban planning has developed into its current forms. It will be explained how the concepts are connected to the wider scientific context by presenting IoT-based smart cities as a modern way of implementing urban planning. Hence, this chapter is presenting the first part of the theoretical framework and gives the meaning for IoT related research from the perspective of smart urban planning. This part of the paper gives some preliminary answers to the research questions of “*how can IoT make cities smarter?*” and “*who are the players in an IoT-based smart city ecosystem?*”

2.1 Identifying key concepts

This section gives definitions to the key concepts related to smart IoT-based urban planning: urban planning, smart cities and Internet of Things. The definitions are given to be able to understand the literature review presented in the following sections.

2.1.1 Urban planning

Urban planning is often understood as a synonym for regional or town planning. According to Álvarez et al. (2012, 178), “Regional planning concerns the context and the organization of human activities in a determined space via taking into account the available natural resources and the financial requirements”. Regional planning seeks to optimize the use of regional resources, protect the environment and strengthen the regional competitive advantages. To separate the concepts of urban, regional and town planning, it is stated that town planning can mean any sort of planning. Town planning is often considered as a synonym for regional planning because a great majority of the population nowadays lives in places defined as urban. However, urban planning can be defined as something more limited and precise. (Anthopoulos & Vakali 2012, 178-180; Hall 1982, 7-8.) Urban planning provides activities that are some way “better than the pattern existing without planning (Hall 1982, 7). It is also stated that “urban planning particularizes regional planning

in a residential area” (Álvarez et al. 2012, 178). Hence, urban planning could be defined as a form of regional planning particularized in cities and residential areas.

Urban planning refers to planning in urban areas, cities. Cities are interesting places to study because they are the mirror of society, the people living in the cities. Cities are expressing the ways people are living their lives. When talking about urban areas, one key point is that these areas are consisting of buildings and other built components. The built environment of cities is what dominates the image people are creating of them. Cities are built slowly, during decades, and they are changing constantly. When the demands towards cities change, cities need to change. When the ways people are living are changing, and the number of inhabitants is increasing, cities need to change. Individual people and households are not the only drivers for urban change, businesses have a significant role too. To be able to achieve change, urban planning activities need to take place. (Maclaran 2014, 1-4; 7.) Hence, in this thesis, urban planning is defined as a set of regional planning activities responding to the challenges emerged due to changes in ways people are living.

2.1.2 Smart cities

There are many definitions for smart cities to be found, and therefore a clarification of what smart city means in this specific study needs to be given. According to Abella et al. (2015, 839) *smart city* is “a public-private ecosystem providing services to citizens and their organizations with the strong support of technology”. Also, Anttiroiko et al. (2014, 325) state that “technological solutions lie at the heart of the idea of smart city”. However, smart cities are more than fancy smart buildings and smart services – the importance of human capital in developing smart cities needs to be taken into account, and therefore it is essential to point out that there are two dimensions of the smart city concept: social and ecological. Technology alone can’t change cities, it’s also about the people living and working there. (Anttiroiko et al. 2014, 324-325.) Kim et al. (2017, 159) are supporting the argument by including the people living in the cities to the components of smart urban development: “the essential components of urban development for a smart city should include smart technology, smart industry, smart services, smart management, and smart life”.

The concept of smart cities in this thesis is defined as a set of clever, bright ideas where the newest technologies and digital tools are used to enable cities smartness (Angelidou 2017, 4; Caragliu & Nijkamp 2011, 65-66). As mentioned in the introduction chapter, in smart cities, devices are monitored, controlled and managed remotely. A smart city is a city that can plan its preventive maintenance activities and optimize its resource while maximizing services to its citizens. In smart cities, data is collected real-time and city management can, for example, predict a water main break or water pollution with the help of technology. (Hall 2000, 1; Kim et al. 2017, 259.)

Since giving one comprehensive definition for the smart city concept is challenging, section 2.3 takes a deeper look into the ambiguous concept of smart cities and discusses also criticism towards the concept. In section 2.2, it is clarified why and when urban planning has taken a turn towards smart city development.

2.1.3 Internet of Things

Internet of Things (IoT) is one of the most researched and discussed industrial subject in the information and communications technology. IoT has had an enormous success in the technology industry. It has become a trendy concept which has been used to increase the attention in studies and products, which had led to the situation where it is slightly unclear what IoT really represents. (Atzori et al. 2017, 122.)

Internet of Things can be defined as a network of devices communicating with each other wirelessly. The key is automatic wireless data transportation between these connected devices. (Rathore et al. 2016, 65; Zanella et al. 2014, 22.) Communication, data transportation, and gathering can happen using different types of technological solutions. Therefore, giving one conclusive definition for IoT is challenging. However, there are a few features that occur in most of the definitions. Firstly, the global network infrastructure or network connectivity that needs to be present. Secondly, everyday objects or even people are the key players in IoT. These objects can then with the help of IoT be recognizable, locatable, readable, addressable and controllable. Thirdly, the networks of things are autonomous and self-managing. Fourthly, interfaces between devices and people are intelligent. Fifthly,

heterogeneity of the technologies used. Sixthly, services are associated with the objects. So IoT is not one technology, it is a concept of integrating several different technologies to transmit data from different sources. (Atzori et al. 2017, 135-136.)

IoT-technologies are said to be a new way of answering several societal problems, and it has a remarkable impact in many areas. IoT can enable new ways of education, new ways of designing and controlling buildings and cities that include for example smart homes and smart public buildings, new ways of controlling energy usage and new smart ways of handling health and wellbeing issues. It is said that IoT is an umbrella term for a set of domains that have been used already before the emergence of the IoT concept. The attention on the use of these technologies under the name of IoT has grown remarkably. (Atzori et al. 2017, 137).

It is also important to recognize two use case areas for IoT: small- and large-scale solutions. Small-scale IoT-solutions, also consumer IoT-solutions, are suitable for consumer use, for smart control of private smart home applications for example. Consumer IoT is said to be human-centered, which means that the connected things or devices are usually smart consumer electronic devices. Consumer IoT devices can be classified as machine to user interactions. Large-scale solutions, also industrial or massive IoT-solutions, are used in industrial environments when there are from several hundred to up to hundreds of thousands of connected devices in one network. In industrial IoT, the amount of data transferred is usually significantly higher and the number of devices is also bigger. (Sisinni et al. 2018, 1-2.)

To summarize the definition of IoT in the scope of this thesis, a few commonly used definitions are combined. Rathore et al. (2016, 64) stated that “IoT empowers an object to hear, see, listen and communicate at the same time”. Based on what Rathore et al. (2016, 65) and Zanella et al. (2014, 22) present, it can also be stated that wireless data transformation is the key in today’s IoT applications. Based on Sisinni et al. (2018, 5), smart city applications are good examples of the usage of industrial IoT. Hence, when discussing IoT in this thesis, the focus is on industrial IoT specifically. To summarize the discussion about the concept of IoT, the definition of IoT in this thesis is a large-scale network of devices communicating with each other wirelessly.

2.2 Why do we need smart cities?

In this section, a few steps back in the history of urban planning are taken. The aim is to provide a wider view of what has changed, why and what are the needs of the modern world. The purpose of presenting a short history of urban planning is to provide background information for the phenomenon, in order to understand why smart cities are in the center of urban planning in the modern world just now.

The starting point for all urban and regional planning is identifying social and economic problems and concerns and changes in living habits. The first wave of urban planning started at the end of the eighteen centuries in response to problems caused by the Industrial Revolution. (Hall 1982, 19.) So traditionally, urban planning was born to solve various problems in cities and inhabitants' lives. Why do cities need to be smart today then?

The world's population has been steadily growing, and the living is more and more concentrated into cities, urban areas. Today, almost half of the population lives in cities. Also, the size and amount of urban areas have been increasing significantly. Rapid urbanization has caused various challenges and problems; air pollution, health concerns, waste management problems, fewness of recourses, traffic congestion and aging infrastructures. (Angelidou 2017, 4; Nam & Pardo 2011, 185.)

Discussions of smart cities have been influencing debates about the future of urban development as a tool to solve these problems (Hollands 2008, 303). Nam and Pardo (2011, 185) are also noting that cities need to operate in an innovative way to be able to prevent urban change from being a crisis. Therefore, smart city development can be seen as a new approach to urban development. The smart city concept emerged as an answer to the problems caused by rapid urbanization. (Nam & Pardo 2011, 185.)

Anttiroiko et al. (2014, 324) state that a new dimension to smart city discussions emerged in the late 1980s when people started to be more concerned about environmental issues. Sustainability became a very crucial concept and cities started to build plans for a more sustainable future. According to Yigitcanlar and

Kamruzzaman (2018, 57), the term “sustainability” is commonly used to refer to smart cities. In other words, “smart” is the new “sustainable”. It is a widely discussed theme if cities smartness actually contributes to sustainability. Ahvenniemi et al (2017, 242) state that “sustainability assessment should be part of smart city development”. They also suggest, that instead of the term “smart cities”, “smart sustainable cities” should be used.

Based on the literature review, smart cities are needed to tackle the problems and challenges the urbanism is bringing. When more people are living in cities, environmental sustainability needs to be taken care of even more efficiently by reducing carbon emissions, optimizing the use of electricity, water and gas, and taking care of waste management solutions more efficiently. The same time, people’s lives become easier when processes are digitalized, and things are taken care of.

Despite the popularity of the smart city concept, it is facing some criticism and some challenges in developing them are identified. Section 2.3 discusses these themes in more details.

2.2.1 IoT-based smart cities

In this thesis, a concept of the *IoT-based smart city* is used to refer to the basic ideas of developing smart cities with the help of IoT-technologies. As stated in subsection 2.1.2, IoT in smart cities means devices that are linked to each other and the Internet for fast accessibility. These devices can be for example smart water and electricity meters or monitoring sensors in buildings, sensors in lighting to enable wireless control, and sensors in various other use cases. Data is gathered from these connected devices to be used in preventive maintenance and resource optimization. (Rathore et al. 2016, 65; Kim et al. 2017, 259; Zanella et al. 2014, 22-23.)

IoT-based smart cities are the result of utilizing modern technologies in urban planning. In an IoT-based smart city, devices are linked to each other. To enable this, wireless sensors need to be deployed in different places. In IoT-based smart cities, this sensor-generated data is available in real time. Hence, IoT-based smart cities are cities that use modern IoT-technologies bringing several benefits in the

management and optimization of traditional public services. Zanella et al. (2014, 22) introduce a concept of “urban IoT” which refers to the utilization of IoT-technologies in urban planning. (Rathore et al. 2016, 65; Zanella et al. 2014, 22-23.)

IoT is an enabler of completely new, automated services in developing smarter cities: the structural health of buildings, waste management, monitoring (air quality, noise), traffic congestion, city energy consumption, smart parking, smart lighting and automation of public buildings. (Zanella et al. 2014, 22-24.) Platform thinking is one of the key functions of IoT-based smart cities. It refers to building central technology networks, which can then work as platforms for other smart installations. Using these platforms, different parts can be integrated, and different things can be measured. (Abbate et al. 2018, 2-3.) For example, a smart lighting installation network can work as a traffic congestion control and monitoring network as well when sensors are installed in the same networks gathering information about speed and location of the vehicles.

2.2.2 IoT-based smart city ecosystem

This part of the paper gives a short view on who are the players in IoT-based smart city ecosystems, and what is the role of companies in these ecosystems. Since this thesis has its central focus in IoT ecosystems in the smart city context, a definition for IoT ecosystems needs to be given at first. The meaning of smart city ecosystems, in general, is explained, and then the two different ecosystem types are discussed and combined: smart city ecosystems and IoT business ecosystems.

Visnjic et al. (2016, 13) define an ecosystem as “the interconnectedness of organizations that are mutually dependent on each other’s inputs and outputs”. From a smart city perspective, cities can be conceptualized as aggregate ecosystems of ecosystems that consist of companies and individuals, both with interdependent needs and activities. Mukti and Prambudia (2018, 5) state that “smart city is not a one-way initiative by the government, but it is a massive interaction between numbers of stakeholders, components, services, and technologies”. *Smart city ecosystem* consists of actors that are working together towards developing smart cities. These

actors are citizens, companies, organizations and city managers. Inside one smart city ecosystem, there can be multiple smaller ecosystems. (Abellá-García et al. 2015, 1075; Mukti & Prambudia 2018, 5; Visnijic et al. 2016, 136.)

Originally, IoT was defined as the connected network between physical devices. With the emergence of new IoT technologies and companies, more and more businesses are involved, creating a business ecosystem perspective. According to Rong (2015, 52), IoT-based business ecosystem can be defined as “an extended supply network connecting all stakeholders”. These ecosystems are consisting of three main parts: the network of companies providing the platform, the product or service, and the customers or stakeholders who get feedback from the product or service. (Rong et al. 2015, 50-52.)

Mukti & Prambudia’s (2018) study “Research Direction in Realizing Sustainable IoT Based Smart City Ecosystem” presents one model of IoT ecosystem in the smart city context (figure 1), where different ecosystem players are identified in more detailed. This model divides the network of companies providing the platform into two groups: device manufacturers and software providers. In the first layer, there are the end users. The end users can be individual citizens or a larger group of people working with city infrastructure. The second layer presents the physical IoT devices, which can be for example smart meters. Middleware platforms and software industry stands for data collection, and in the end, the data is delivered to applications. From applications, end users have free access to the gathered data. (Mukti & Prambudia 2018, 5; Rong et al. 2015, 51.)

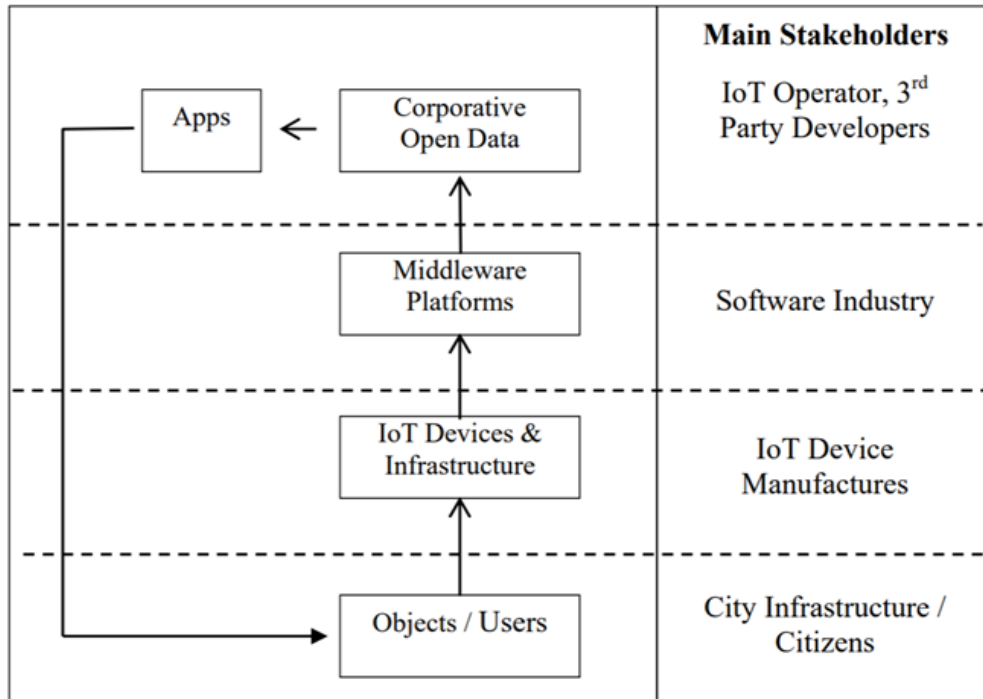


Figure 2: IoT ecosystem in smart city context (Mukti & Prambudia 2018, 5).

So IoT-based smart city ecosystem includes multiple actors which are bringing value to each other. In subsection 3.2.2, value co-creation is discussed and the meaning of value and value creation in IoT-based smart city ecosystem context is explained. Also, a definition of business ecosystems, in general, will be given in order to understand the phenomenon as a whole.

2.3 Criticism and challenges of smart cities

After giving definitions to the key concepts in the previous parts of the paper and taking a few steps back in the history to see how city planning has developed to urban planning and its current trends, it is relevant to take a deeper look into the topical trend in urban development towards smarter cities. In this section, the concept of smart cities is re-examined, and the criticism and challenges of the concept is discussed.

As mentioned in the subsection 2.1.2 where the concept of smart cities in the scope of this thesis was defined, there is no consensus on what smart city is, despite its popularity as a concept and in practice. There is no common understanding of what the key drivers and desired outcomes for smart cities are, and how the paradigm can be conceptualized. Different conceptual variants are used when describing smart cities, by replacing the word “smart” with “intelligent” or “digital”. (Albino et al. 2015, 4; Yigitcanlara et al. 2018, 157.)

Despite the popularity of the concept, numerous researchers and government professionals have criticized the idea of smart cities. The idea has mainly been criticized to be too technically oriented, and that it is often forgotten that the concept does not stand only for technology changes but also “investments in human capital and changes in urban living practices and conditions” (Neirotti et al. 2014, 26). Therefore, it has been suggested that the concept of smart cities should be seen as a combination of two different types of domains: hard domains and soft domains. Hard domains include automated energy grids, public lighting solutions, logistics and transportation, and smart buildings. Soft domains then represent education and culture, public administration and economy. (Albino et al. 2015, 4; Neirotti et al. 2014, 26-27). In this thesis, the focus is strongly in hard domains.

As the previous section already mentioned, there are discussions on how sustainable smart cities are. Some researchers are presenting the idea of smart cities as a synonym for sustainable cities (e.g. Ahvenniemi et al. 2017), but Yigitcanlar and Kamruzzaman (2018, 57) state that “there is little empirical evidence that, despite its promise, smart cities contribute to sustainability agenda”. So, the sustainability and the impacts on environmental issues are still being researched.

There are numerous recognized challenges in smart city development. Not only are the smart city projects expensive (Yigitcanlara et al. 2018, 146), but it is stated that the deployment of technical smart city solutions would need the city councilors and stakeholders to be technically oriented enough to understand the possibilities and different options to choose from (Anttiroiko et al. 2014, 325; Yigitcanlara et al. 2018, 146).

3. INTERACTIVE MARKETING AND VALUE CREATION IN BUSINESS ECOSYSTEMS

The identified challenge and the starting point for this thesis is to find a way of benefiting from interactive marketing methods in B2B companies operating as parts of the IoT-based smart city ecosystems. In this part of the paper, the key marketing related concepts are defined at first; *marketing*, *business-to-business* and *business ecosystems*. After giving definitions to the key concepts, a deeper look into these themes is taken by introducing marketing in the business environment and the key features of interactive marketing as one way of executing direct marketing. The definition of these concepts in the framework of this thesis is clarified. This part of the paper will give a theoretical framework and some preliminary answers to the last research question “*which are the tactics to reach B2B audience in IoT industry?*”. This chapter will also give more theoretical background information in order to understand the third research question, “*how do different actors contribute to value co-creation in IoT ecosystems?*” by clarifying the meaning of business ecosystems and value creation in them.

3.1 Identifying key concepts

This section gives definitions to the key concepts related to marketing and value creation in business ecosystems: marketing, business-to-business and business ecosystems. The definitions are given to be able to understand the literature review presented in the following sections.

3.1.1 Marketing

“Marketing is managing profitable customer relationships”, according to Kotler and Armstrong (2010, 28). The main purposes of marketing are to attract new customers and keep and grow current customers. This is done by creating and delivering superior value to the customers. All successful companies today have to be committed and focused on marketing heavily, especially now when markets have become more global and competition is even more fierce. To be able to compete in globalized

markets, companies must satisfy the needs of customers better than their competitors. (Kotler & Armstrong 2010, 28-29.) According to Sargeant and West (2001, 2), in the heart of all definitions marketing is the idea of achieving organizational goals by understanding the wants and needs of target markets and then serving these wants and needs better than competitors (Sargeant & West 2001, 2).

Two main approaches are used in marketing: mass marketing and direct marketing. Mass marketing targets big groups of customers, and direct marketing is focused on delivering the marketing message to a carefully chosen group or individual. (Kotler & Armstrong 2010, 32.) When discussing marketing in this thesis, the focus is on direct marketing. Section 3.4 will clarify the meaning of direct marketing and the purpose of executing it.

Marketing process starts by understanding the marketplace and customer needs and then finding a way to create customer value. Then, strong customer relationships can be built. In the end, the value is captured from customers back to the company to create profits and customer equity. (Kotler & Armstrong 2010, 29-30.) All systems and processes in organizations should be planned so that they can deliver value to customers every time they are in contact with the organization. Marketing is not just a narrow organizational function – it is rather a guideline for a way of working and understanding customer needs and value delivery for all staff in the whole organization level. (Sargeant & West 2001, 5.)

3.1.2 Business-to-business

Markets are divided into two main categories: consumer and business markets. Consumer markets (Business-to-Consumer, B2C) are the ones where customers are individual people. In business markets (Business-to-Business, B2B), customers are organizations consisting of many individuals. (Kotler & Armstrong 2010, 158; 190.) In other words, according to Kotler and Armstrong (2010, 190), business customers are those that “buy goods and services for use in producing their own products or services or for resale to others”.

So the key feature that distinguishes business markets from the consumer markets is that customers are organizations rather than individual consumers. The purchased

products and services can often be the same. Therefore, it is sometimes slightly problematic to draw a clear line between B2B and B2C markets. The key point is that the volumes in the business market are significantly higher: it can be stated that business marketers serve the largest market of all. (Brennan et al. 2007, 2-3; Hutt & Speh 2009, 4; Kotler & Armstrong 2010, 190.)

Business and consumer markets have traditionally strictly been separated from each other. During the past few years, an increasing trend has been blurring the line between these two. It also needs to be pointed out that when discussing business markets, also other organizational buying, nonbusiness markets, are included. For example, institutional and government markets. The institutional market is consisting of institutions providing services and goods to people, schools and hospitals for example. The government market is a large market providing companies operating there huge possibilities. Governments are usually making huge purchases which means more money for businesses. However, governmental purchases are strictly regulated and buying processes can be long. (Kotler & Armstrong 2010, 205-208.) From the viewpoint of B2B companies operating in smart city ecosystems, governmental buyers are the biggest end customers.

3.1.3 Business ecosystems

The focus in companies in most sectors has changed from competing on efficiency to competing on innovation. Companies have discovered that they can't change the world alone and that they need an ecosystem of other companies to innovate with them. For the end users, the advantages of business ecosystems are that prices go lower through market-oriented competition, co-invention, and improved performance. (Moore 2006, 32; 62.)

James F. Moore, the pioneer of the business ecosystem approach, is comparing business ecosystems with biological ecosystems. He defines a biological ecosystem as a "community of organisms, interacting with one another, plus the environment in which they live and with which they also interact..." He defines the interacting individuals and organizations of business ecosystems as the organisms of the business world. This economic community is consisting of suppliers, lead producers,

competitors, and other stakeholders, who co-create value to customers, who are themselves members of the ecosystem too. (Moore 1996, 26.)

Moore is strongly linking the concept of coevolution to business ecosystems. He is referring to Gregory Bateson's (1979) observation that all the parts of systems are coevolving. By coevolving he means "a process in which interdependent species evolve in an endless reciprocal cycle". (Moore 1996, 11.) Moore is using the concept of economic coevolution to describe the coevolution occurring in business ecosystems. Companies need to understand that they live in rich and dynamic environments of opportunities and that by finding the centers of innovations that they can benefit from. (Moore 1996, 12.)

One of the very first steps in coevolution process is creating value in the ecosystem. The goal is to find ways to create such value that is something new, more valuable for customers than the value that is already available for them. By cooperating and bringing innovative ecosystem players together this can be done better than organizations are capable of alone. (Moore 1996, 69-71.) Section 3.3 and its subsections are discussing value and value creation in more details.

3.2 Business marketing

To be able to gain a full understanding of the researched phenomenon, it is relevant to clarify the definition of B2B from a marketing perspective. As it has been said earlier, growing enables companies to compete more effectively, satisfy their stakeholders and attract a talented workforce. In order to grow, efficient marketing tactics need to be used and the right marketing strategy needs to be in place. The core goal is to create superior value for customers, which then leads to higher customer loyalty and retention, the share of market and customer, and customer equity. (Kotler & Armstrong 2010, 28; 45; 67.) The following two subsections will present the basic ideas of business marketing, and the subsection 3.2.2 discusses the recent changes in business marketing. It presents the changes happening in marketing just now, especially in business marketing.

As presented in subsection 3.1.2, B2B refers to markets where customers are organizations rather than individual consumers. What comes to marketing, there are

differences between B2B and B2C strategies. This thesis is focusing on interactive marketing, and since the usage of social media is one of the key areas of interactive marketing, Iankova et al.'s study about differences in social media usage between B2B and B2C companies can be found very interesting. The paper confirms the assumption of B2B marketers having different methods in social media usage in marketing than B2C marketers. The paper also states that B2B companies may be more concerned about the risks of social media and that the channels used are different than the ones often used in B2C. (Iankova et al. 2018, 9.)

The reason why B2B and B2C marketing have traditionally been seen as two completely different approaches, especially from marketing point of view, is because of the different features of the customers. The next two subsections are discussing the key features of business customers and the changes that have been influencing and changing business marketing during recent years.

3.2.1 Business market and customers

To be able to understand the researched phenomenon, one needs to understand what the special characters of business markets and customers are. Also, companies who are marketing to business customers need to understand business markets and business buying behavior. Then, the ultimate goal is to build profitable relationships with business customers. B2B markets are similar to B2C in many ways. Both involve people, who's needs should be satisfied. The main differences are in market structure and demand, the nature of the buying unit and the decision process during the purchase process. When B2C marketers usually deal with many different customers at a time, B2B marketers do that with far fewer. However, these few buyers are much larger than in B2C markets. Demand in business markets is also less affected by price changes in the short run. Finally, the demand in business markets tends to change more and more quickly than in B2C markets. (Kotler & Armstrong 2010, 192-194.)

Business purchases involve more decision participants than consumer purchases. Often, the buyers in business markets are trained to buy better. Buying committees are often consisting of technical experts and top management. Therefore,

companies need to have trained professionals to sell and market to these well-trained buyers. In general, buying decisions are more complex in business markets. Business buying is usually more formalized, which means detailed product specifications, written purchase orders, and formal approvals. Finally, the buyer and seller are more dependent on each other and the relationships built are often long-term and they work closely together. (Kotler & Armstrong 2010, 192-194.)

What business marketers want to understand is how business buyers respond to various marketing stimuli. Business buyers, as well as consumers in B2C business, are subject to many influences when making their buying decisions. These factors are not only economic, but also personal factors play a significant role. The key point here is to remember that business buyers are humans and social too, and they react to reason and emotion. They have different personalities and learned experiences that influence their buying decision. (Brennan et al. 2007, 42; Kotler & Armstrong 2010, 199.)

As mentioned earlier, business buying is more complex and involves both more participants and steps in the buying process. Kotler and Armstrong (2010, 201) have given one example of the common stages of the business buying process with eight different steps. These eight steps include problem recognition, general need description, product specification, supplier search, proposal solicitation, supplier selection, order-routine selection, and performance review. From the business marketer's point of view, the stage of supplier search is favorable. When searching suppliers, companies are trying to find the best vendor by possibly comparing the possible product or solution providers with each other. That is where marketing actions come extremely efficient, and it is particularly important for sales and marketing people to watch for companies that are in the process of finding new suppliers. (Kotler & Armstrong 2010, 209-210.)

3.2.2 Changes in business marketing

Marketing environments are constantly changing. When the environment changes, so must the companies operating there. Kotler and Armstrong (2010, 49) are presenting four major developments and trends that have had a significant impact on

marketing: digital age, globalization, the call for more ethics and social responsibility and the growth of non-profit marketing. Digital transformation has made the world and the people more connected than ever before and has created completely new marketing channels and ways of marketing. Information and other digital technologies have enabled marketers to create databases of customers in order to run targeted campaigns, and a real-time interconnection between companies and their customers is now possible because of the Internet. Online marketing is, therefore, the fastest growing marketing form nowadays. Globalization has made competition global, and many companies today are connected globally with their customers, partners, and competitors. Rapidly growing environmental concerns have also affected marketing and companies in general by putting pressure on them to be the bellwethers of socially responsible and green actions. This needs to be considered in marketing tactics too. (Kotler & Armstrong 2010, 49-51.)

Today, social circles play a significant role in people's lives. Kotler et al. (2017, 17) are using a concept of social inclusivity. Social inclusivity is happening both online and offline. For example, social media drives inclusivity by giving people a feeling of belonging in their communities without demographic and geographic barriers. From a marketing point of view, this means that customer communities have become even more powerful. The Internet enables customers to share stories and opinions, both good and bad, and these stories are influencing buying decisions of other customers. Customers tend to go for what is trendy, what others are buying. Kotler et al. have summarized this "as if customers were protecting themselves from false brand claims and campaign trickeries by using their social circles to build a fortress". (Kotler et al. 2017, 15.)

Customers today are not passive targets for advertising, they are rather becoming an active media of communications. It can be stated, that companies don't have as much control in marketing communications as they used to have. Customers are tightly connected to marketing actions nowadays. Connectivity can be seen as the main game changer in marketing in general, now when customers and competitors are becoming collaboration partners. The ability to connect has brought together not only customers but also has given small companies bigger playfields. Small, new, local companies have now a chance to compete against big global

corporations. (Kotler et al. 2017, 18-21.) This means, even more global ecosystems can be built easier.

As section 3.2 presents, traditionally, business and consumer marketing are separated from each other. It is stated that the markets, customers and decision processes are different, and therefore the marketing strategies used need to be different too. Traditional decision theories in B2B were focusing on rational choice processes in economics and statistics, while emotions have been playing a significant role in B2C marketing for a long time (Pandey & Mookerjee 2017, 170-171). Pandey and Mookerjee's study (2017) shows, that emotions do affect buying decisions in business buying too. Also, a research of Kemp et al. (2018) shows, that it is essential that marketers understand emotions and the role of them in business buying.

In general, the Internet and smartphones have had a significant impact on marketing in both B2B and B2C (Grubor & Jakša 2018, 269; Kotler & Armstrong 2010, 528; Watson et al. 2013, 842). Sections 3.4 discusses this change more specifically when a deeper look into direct and digital marketing is taken.

3.3 Value creation in business ecosystems

Since this thesis is focusing on IoT-ecosystems from the smart city perspective, the nature and necessity of business ecosystems, in general, must be discussed. In subsection 2.3.2 the concept of business ecosystems was defined on a higher level, but this section focuses on value creation in business ecosystems specifically. Kotler and Armstrong (2010, 71) are also referring to “value delivery networks” when discussing business ecosystems. They are highlighting the importance of partnering with other companies to form an effective value chain that serves their customers. Kotler and Armstrong (2010, 72) are also stating that nowadays competition takes place between entire value delivery networks, or ecosystems, rather than between individual competitors.

There is a surprisingly large amount of researches about business ecosystems leaving customers completely outside of the ecosystem thinking. For example, Basole et al. (2015) are only discussing co-operative companies who need each other to

deliver the best possible solution for their markets. Instead, Joo and Marakhimov (2017, 2; 4) are highlighting customers as co-creators in business ecosystems by consuming products and services. The pioneer thinker of business ecosystems, James. F. Moore, also introduced customers as one of the key players and essential parts in business ecosystems (Moore 1996).

Rong et al. (2015, 53) are using a concept of IoT-based business ecosystem referring to business ecosystems around IoT-companies and customers. These ecosystems are complex networks consisting of different stakeholders who can contribute to business and value co-creation in business ecosystems. Based on the literature review made, customers are one of the most important parts of these ecosystems. (Rong et al. 2015, 53; Joo & Marakhimov 2017, 2; 4.)

In the next two subsections, the concept of value co-creation and its role in IoT-ecosystems is clarified.

3.3.1 Value

To be able to understand what value creation in IoT-ecosystems means, one needs to know the key features of value and value creation in general. In section 3.1 it was mentioned that the ultimate objective in marketing is creating value for all parties involved. That means creating value to customers and capturing the value for the company. Customers get value from purchasing goods or services they are willing to pay for and companies get economic value when customers are purchasing their goods or services. (Brennan et al. 2007, 91-92; Kotler & Armstrong 2010, 26.) Value is strongly linked to business ecosystems too. Moore (1996, 11) is discussing coevolving as one of the key features in business ecosystems. To be able to co-evolve, value in the ecosystem needs to be created (Moore 1996, 71).

When discussing value creation in general, also in the level of individual organizations, they need to be able to create value for customers. Companies need to decide who their customers are by dividing the market into segments. When the targeted customers are chosen, companies must also decide how they will serve their targeted customers. Therefore, a clear value proposition needs to be in place. Value

proposition is “the set of benefits or values it promises to deliver to consumers to satisfy their needs”. In addition to company’s own marketing activities, they must effectively partner with other companies to form a value delivery network. In a value delivery network, the performance of the entire system can be improved. (Kotler & Armstrong 2010, 33; 71.)

What is value then? Literature discussing value is mostly focused on customer value. This thesis takes a look into value created in the business ecosystems between all ecosystem players, not only customers, even though they are an important part of the ecosystem. However, let’s focus on customer value first. According to Day & Moorman (2010, 25) customer value composes when the perceived benefits of purchasing a certain product or service are greater than the total costs of obtaining the product or service. Perceived risks are also impacting the value formation negatively, if the risks are high. Risks are related to trust towards vendors. Customers want to be sure they get what they were looking for, and that the offering performs as promised. In general, big vendors with known brand and plenty of recommendations are more trusted. “Perceived costs” does not only mean the price paid when purchasing the product or service, it means the total costs during the product lifetime. It can include the costs deriving from acquiring the product, such as ordering and installing, psychological costs of learning to use a new product, and maintenance and disposal costs. Maintenance costs can be repairing costs for instance. (Day & Moore 2010, 25-26.)

When discussing value in this research, it means both value for end customers and value for other ecosystem players inside a business ecosystem. The next subsection is addressing value co-creation, especially in IoT-ecosystems.

3.3.2 Value co-creation in IoT-ecosystems

Now that the features of value and value creation are explained on a higher level, a closer look into value and its co-creation in ecosystems must be taken. Peltola et al. (2016) are strongly linking value capture and creation with ecosystems in their study of “*Value capture in business ecosystems for municipal solid waste management: Comparison between two local environments*”. The paper presents the ways value is captured and co-created among waste management ecosystem players, and

states that value is created together with the ecosystem players and different stakeholders are bringing different value to the ecosystem. According to Peltola et al. (2016, 1271), “business ecosystem refers to value-oriented perspective for company networks”.

Value co-creation has traditionally been researched as an interaction between a company and its customers, leaving ecosystem thinking and other players in them outside. Co-creation in ecosystems happen when dynamic collaborative actions between different ecosystem players take place and they join their forces. The co-created value in ecosystems is something one organization couldn't provide to its customers alone, without the help of ecosystem of other organizations. (Pera et al. 2016, 4024; 4034.)

As Peltola et al. (2016) state, different ecosystem players bring different value to the ecosystem. Literature suggests different approaches to IoT-ecosystems and value ecosystem players are bringing to them. For example, Papert and Pflaum (2017, 179) are presenting a very simple value co-creation based IoT-ecosystem model which consists of only two parts: a device part and an application part. The device part stands for smart products, such as smart meters, and the application part can be the connectivity software for example. In this case, value can be easily co-created when combining these two parts a whole IoT-solution can be provided to end customers. Behmann and Wu (2015, 16) are presenting a model of Collaborative IoT, consisting of sensing, gateway and services.

When narrowing the IoT-ecosystem thinking to smart city applications and considering the theory of business ecosystems, it can be noted that these two models are again leaving customers outside of the ecosystem. As Moore (1996) stated, customers are key players and essential parts in business ecosystems. The value they are bringing to ecosystem is implementing the solutions the companies in these ecosystems are providing.

3.4 Direct marketing

Discussing direct marketing and its methods is needed to be able to understand the core concept of interactive marketing. Before defining the concept of interactive marketing in detail, a short look into digital marketing is taken. Digital marketing provides a link between direct and interactive marketing, and sometimes they are even considered to have the same definition. Direct and interactive marketing are often seen as two overlapping concepts, and digital marketing is presented to be one form of direct, interactive marketing. In this thesis, direct marketing is seen as an umbrella term including both interactive marketing and digital marketing as a way of executing direct marketing, which can be interactive too. When discussing online marketing in this thesis, it is considered as a synonym for digital marketing. Section 3.4.1 explains this in more detail.

As stated in subsection 3.1.1, two main approaches are used in product advertising and promotions: Mass marketing and direct marketing. Mass marketing targets big groups of customers, when direct marketing is focused on delivering the marketing message to a carefully chosen group or individual. Examples of mass media are television, radio, magazines and newspapers. Mass marketing does not recognize different customer groups and it delivers the same marketing message to everyone. One of the very first starting points of marketing is to divide the market into segments to be able to go after these chosen individuals or groups, by using target marketing tactics. (Bose & Chen 2009, 1; Kotler & Armstrong 2010, 32.)

Studies show that a paradigm shift in marketing is on its way. It is said that more and more different direct marketing techniques are constantly becoming more popular, and that digital marketing is changing marketing remarkably. Direct marketing is said to be in the center of communications revolution just now. It's popularity among marketers in different businesses, organizations, associations and individuals across the world is growing rapidly. The new way of marketing is also changing the way companies are thinking about customers and building relationships with them. Direct marketing techniques are increasingly used to interact with customers directly rather than targeting masses with traditional advertising. (Spiller & Baier 2010, 3-4.)

Direct marketing has many definitions. Kotler and Armstrong (2010, 514) state that direct marketing means communicating directly with carefully targeted customers, often one-on-one. Spiller and Baier (2010, 4-5) define direct marketing as database-driven marketing, where the focus is on interactive process of communicating directly with targeted customers via one or multiple channels. Bose and Chen (2009, 1) are using a concept of “personalized advertising”, which combines the key features of direct marketing in two words. (Bose & Chen 2009, 1; Kotler & Armstrong 2010, 514; Spiller & Baier 2010, 4-5.)

The main forms of direct marketing are face to face selling, direct-mail marketing, catalog marketing, telemarketing, direct-response television marketing, kiosk marketing, online marketing and other new digital technologies. New digital direct marketing technologies include mobile phone marketing, pod- and vodcasts and interactive TV. (Kotler & Armstrong 2010, 519; 525-528.) According to Sargeant and West (2001, 6), the key starting point in direct marketing is the customer database. Data about customer behavior is stored and analyzed, and marketing messages are targeted to only those that are known to have an interest and that are likely to receive these messages positively. In the modern era, the Internet and database technology is enabling the process of tracking customer behavior. Information about customers is now being easily captured and analyzed. (Sargeant & West 2001, 6-7-)

As mentioned earlier, in this thesis, direct marketing is seen as an umbrella term including both interactive marketing and digital marketing as a way of executing direct marketing. According to Kotler and Armstrong (2010, 515), direct marketing is more and more being executed online. They state that digital marketing, also online or internet marketing, is the fastest growing trend in marketing in general and that internet driven sales is now more popular than ever before. To be able to understand the concept of interactive marketing, the next subsection will discuss digital marketing in more details.

3.4.1 Digital marketing

Digital marketing is often used as a synonym for online marketing, and based on Kingsnorth's definition (2016, 6) it is considered as a modern term for online marketing. Kingsnorth is stating, that nowadays in the era of smart phones and TVs digital marketing is much more than online marketing (Kingsnorth 2016, 6). Since marketing literature is mostly considering digital and online marketing as synonyms (e.g. Ryan 2004, Spiller & Baier 2005; Sargeant & 2001), they are both referring to the same approach to marketing in this thesis.

Digital marketing can be seen as a modern form of direct marketing (Spiller & Baier 2010, 4). It can be defined as "company efforts to market products and services and build customer relationships over the Internet" (Kotler & Armstrong 2010, 528). The internet has changed the ways customers are buying by making purchase processes faster and giving better opportunities to compare products and services by searching information from the Internet. As a result, also marketers have new ways of creating value and build relationships with customers. (Kotler & Armstrong 2010, 528.) For example, as already shortly discussed in subsection 3.2.1, there are eight stages in the business buying process. One of the most important steps for marketers is supplier search. Today, most of the supplier searching activities are made in the Internet. The Internet and online marketing tactics are leveraging the playfield for smaller suppliers when all the same tactics that bigger firms are using can be used and depending on business model and the product or solution that a company is providing, online purchases can be made too. (Kotler & Armstrong 2010, 201; 2014.)

Kotler and Armstrong (2010, 529) are presenting a model of four online marketing domains (figure 3). The domains are B2C (business-to-consumer), B2B (business-to-business), C2C (consumer-to-consumer) and C2B (consumer-to-business). It classifies online marketing by who initiates it and to whom it is targeted.

	Targeted to <i>customers</i>	Targeted to <i>businesses</i>
Initiated by <i>business</i>	B2C (business-to-customer)	B2B (business-to-business)
Initiated by <i>customer</i>	C2C (customer-to-customer)	C2B (customer-to-business)

Figure 3: Online marketing domains (Kotler & Armstrong 2010, 529)

Most attention has been paid to business-to-consumer (B2C) online marketing. In B2C, businesses are selling products and services online directly to final consumers. Today, almost everything can be purchased online. Also, business-to-business (B2B) online marketing is flourishing. B2B marketers are using for example B2B Web sites, e-mail, online product catalogs, online trading networks and other online recourses. Their goal in online marketing is to attract new business customers and serve current ones more effectively. Online marketing doesn't necessarily mean selling products and services online – for B2B companies, the Internet is a tool to build stronger relationships with business customers. Consumer-to-consumer (C2C) online marketing refers to online buyers creating product information by connecting with other consumers. This being said, a new buying influence is created: “word of Web”. It means that information that can be found in the Internet is influencing consumers buying decisions. Finally, consumer-to-business (C2B) online marketing refers to situations where consumers are directly communicating with companies in the Internet. Consumers can give feedback and reach out to companies rather than waiting the companies to find and contact them. (Kotler & Armstrong 2010, 259-532.)

Conducting basic digital marketing activities includes firstly creating a website, secondly placing ads or promotions, thirdly using e-mail, and fourthly setting up social networks. An effective website is easy to find and use, the content is informative and versatile (text, pictures, sound and video), communication between seller and buyer is made easy, it looks professional and has links to other related sites. (Kotler & Armstrong 2010, 532-535.) One of the important developments that has affected on digital marketing is the use of smart phones. Therefore, websites must

be mobile optimized so that they are easy and effective to use with mobile devices too. (Grubor & Jakša 2018, 269; Watson et al. 2013, 842.) Ads and promotions can be placed in websites as banners and pop-ups, and search engine marketing (SEM) can be used to increase visibility of a website. It is based on paid advertisement links and search engine optimization. In practice, it means getting certain company's results showing higher in search engine results when searching for certain keywords related to the company or its offerings. (Grubor & Jakša 2018, 268; Kotler & Armstrong 2010, 535-536.) Also, more and more companies are using chat-bots on their websites to provide immediate customer service support to the website visitors. Studies show that at least in B2C, "consumers who chat with sellers tend to make a purchase". (Lv et al. 2018, 109.)

In addition to creating a website and placing ads or promotions, e-mail campaigns and social networks are effective digital marketing channels. The dark side of growing e-mail marketing is the explosion of spam – unwanted commercial e-mails are generating irritation and frustration. Therefore, "permission-based e-mail marketing" is said to be recommendable. That means sending commercial emails only to customers that have indicated their willingness of receiving these emails. Creating or participating online social networks refers to blog writing and social networking websites. (Kotler & Armstrong 2010, 537-540.)

3.4.2 Interactive marketing

Interactive marketing, often referred as digital and online marketing, can be defined as a modern form of direct marketing. The key feature of interactive marketing is a two-way conversation between the company and its targeted customers. It is about putting the customer first and understanding the behavior and needs of the customers. Interactive marketing is about delivering personalized experiences to serve and engage customers better. The ultimate goal is to develop long-term relationships with customers. (Aslam et. Al. 2015, 27; Dushyenthan 2012, 57; Ryan 2004, 20-21; Stone & Woodcock 2013, 4.)

Interactive marketing is based on participatory activities of customers. It is a consumer-driven dialogue between the service or product provider and customers,

and it provides instant feedback. One of the key features of interactive marketing is “the opportunity to go from product interest to product order in a matter of seconds”. (Ryan 2004, 5-8; Spiller & Baier 2005, 9; 20-21.) Even though most of the definitions of interactive marketing are presenting the feature of receiving instant feedback as one of the key points of interactive marketing, Ryan (2004, 10-11) is presenting four different levels of interactivity. These levels present the amount of interactivity happening between the company and its customers. Table 1 presents the four levels and actions made in each level.

	Actions	Channels and Examples
Level 1	No provision made for interactivity, marketer is not seeking response from the prospect.	Image ads in online or printed material
Level 2	Consumer initiates a response to a direct marketing promotion. Marketers encourage a response and provide tools for responding	E-mail marketing, broadcast.
Level 3	Consumer initiates interaction with an electronic system	Online marketing, interactive TV etc.
Level 4	Person-to-Person contact between the company and prospect	Chat and other instant messaging

Table 1: Four levels of interactivity (Ryan 2004, 11).

In level one, marketer is not seeking immediate responses when delivering marketing messages. In level two, tools for responding are provided and the marketer wishes for instant feedback. In level three, consumers interact with an electronic system. This can be an automatic chat bot, or interactive TV for example. In level four, real person-to-person contact is taking place and consumers can have a direct contact with company staff. This theory partly contradicts the common assumption of direct marketing always including person-to-person feedback. Therefore, in this thesis, interactive marketing is defined as a way of marketing where the starting point is the actions the customers or prospects are making themselves, without marketers pushing them.

As table 1 also shows, interactive marketing can use many different types of media and channels, but during the past few years, the focus has strongly been in digital

marketing. As mentioned in the subsection 3.4.1, emerging trends in digital marketing nowadays are blogging, search engine marketing (SEM), online social networking and mobile marketing. (Ryan 2004, 5-8; Spiller & Baier 2005, 20). These trends can be seen interactive, and Barwise and Farley (2005, 73-74) are including them to their list of most common interactive marketing activities.

In their list, Barwise and Farley (2005, 73) are stating that web-based activities are the most popular ones among companies. Internet based activities include for example websites, web advertising, permission-based e-mailing and online promotions. The category of websites includes public websites, search engine optimization that was shortly discussed in subsection 3.4.1, extranets which means password-protected websites for certain website visitors, e-commerce which stands for buying products and services online, and making different websites for different groups based on their needs. Web adverts include fixed-fee web advertising, which means paying to place banner ads on a third-party website, cost per lead which stands for deals with third parties on a “cost-per” basis, and barter means placing ads on a third-party’s site and vice versa. Permission based emailing gives the prospects and customers an option to opt-out if they do not want to receive certain marketing emails, or they can opt-in if they specifically want to receive them. SMS-messaging is becoming more and more popular among B2C companies especially, and a smaller minority is using other interactive marketing activities, such as interactive TV. (Barwise and Farley 2005, 73-74.)

Their research also shows, that a growing number of companies are using mobile marketing techniques (SMS messaging), and some also interactive digital TV. It still can be stated, that the Internet remains as the most popular channel. Table 2 shows the different interactive marketing techniques summarized by Barwise & Farley (2005).

Category	Activities
Website(s)	Public website, search engine optimization (SEM), extranets, e-commerce, different sites for different groups
Web advert/sponsor	Fixed-fee web advertising, cost per lead, advertising barter, sponsorship
E-mail	Permission based emailing
SMS	SMS to respond, contacting using SMS
Other interactive marketing	Online promotions, interactive digital TV, other interactive technique

Table 2: Interactive marketing techniques (Barwise & Farley 2005, 73).

Sargeant and West (2001, 336; 350) are also adding traditional telemarketing and trade fairs to the list. In addition to these, Spiller and Bayer (2010, 177; 215-216) are mentioning radio and they are also highlighting the meaning of blogging, online social networking and mobile marketing. To complete the list of interactive marketing techniques, Ryan (2004, 110-111; 212-228) discusses the possibilities of using online seminars and other web events and even virtual reality. As mentioned earlier, Kotler and Armstrong (2010, 527) are mentioning pod- and vodcasts as efficient marketing techniques too.

So interactive marketing is a modern form of direct marketing, where Internet is one of the key parts and marketing channels. Figure 4 presents how these three concepts of direct, interactive and digital marketing are related to each other and are partly seen as three overlapping concepts.

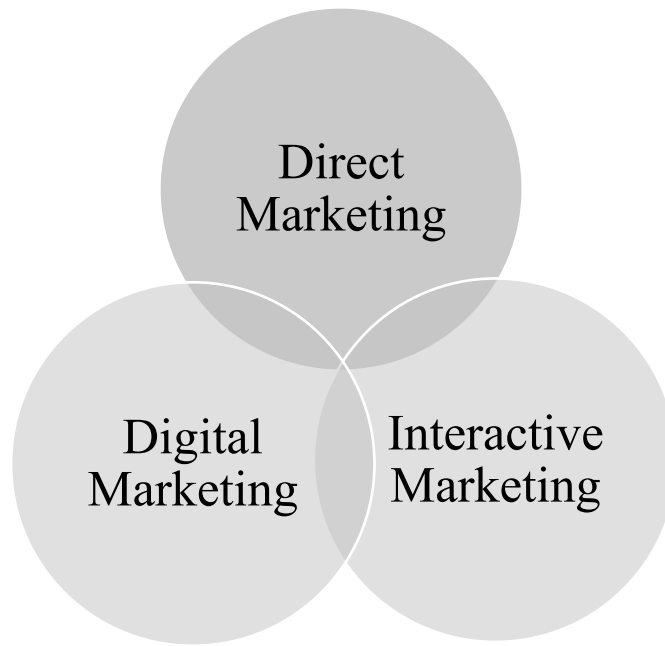


Figure 4: Interconnections between Interactive Marketing, Direct Marketing and Digital Marketing

4. EXECUTING THE RESEARCH

This chapter presents the used research methods and arguments why these methods are used. In addition, the data collection process and the case company are presented. It is said, that a qualitative study is commonly used to gain overall knowledge of a certain phenomenon. As a research method, it is flexible, and plans can change during the study. (Hirsjärvi et al. 2014, 164.) Tuomi and Sarajärvi (2018, 9) are strongly highlighting the importance of the theoretical framework of the qualitative study.

This thesis is a qualitative case study. The studied phenomenon needs to be researched in a real environment that enables to evaluate the role of interactive marketing in IoT-based smart city ecosystems. The collected data is analyzed deductively through already existing theory, to which the writer has taken a deep look by doing a literature review. This thesis is a case study, which means it provides intensive and detailed information on this phenomenon in a specific environment (Hirsjärvi et al. 2014, 134).

Hirsjärvi et al. (2014, 181) state that qualitative study begins usually by studying the field where the researcher operates. The interviews with the employees and partners and customers of the case company started with conversations about IoT and smart cities, and the marketing methods used were examined. The next section will discuss the data collection methods more specifically.

Another way of approaching the theme would have been to send a wider questionnaire to customers of several companies operating in the smart city ecosystem, combining the data from different kinds of companies. That would give a wider perspective and would enable profiling different types of ecosystem players into groups. This thesis will be strictly focusing on interactive B2B marketing in this particular case company, and its role in the smart city ecosystem. By choosing to interview a few most important operators in the field of smart cities, a more detailed view on marketing in the industry can be researched.

4.1 Data collection

Qualitative interviews are usually categorized into three different groups: unstructured, semi-structured and structured interviews. Structured interviews are commonly used in quantitative researches, and therefore it was left out of the options for this thesis. In semi-structured interviews, the main themes and some most important questions are decided beforehand, and other questions tend to emerge from the dialogue during the interview. (DiCicco-Bloom & Crabtree 2006, 314-315.)

In this thesis, the data is collected by using the method of semi-structured theme interviews. Three employees and five customers and partners of the case company were interviewed. Hirsjärvi et al. (2014, 164) state that one of the key features of qualitative study is to gather the data in natural real situations where people are the primary source of information. Those people are chosen carefully rather than randomly picked. (Hirsjärvi et al. 2014, 164.) In this thesis, five of the interviewees were chosen based on snowballing – other informants were used to getting to know the best interviewees and introduce them (Taylor et al. 2015, 107). In this thesis, these other informants were lead salespeople of the case company. The interviewees

they were suggesting were the lead contact people working for five companies that are working closely with Wirepas Oy in their ecosystem in the field of smart cities. The purpose was to choose different types of companies which are co-operating to enable various types of Smart City applications. The sizes of the companies vary from 30 up to 140 000 employees worldwide, which enabled the researcher to take a wider look into different kinds of perspectives. Since the end customers in Smart City applications are the cities itself, an employee of Smart Tampere project was interviewed. Similar smart city projects are ongoing in many cities in Finland, but the case company Wirepas has been co-operating with Smart Tampere in piloting a smart lighting application and therefore Tampere city was chosen to give the city's perspective into this thesis. According to Taylor et al. (2015, 107), researchers must "look for a particular type of person who has had certain experiences". As this thesis is focusing on marketing practices, the interviewees inside the case company were chosen due to their key roles in company's marketing operations. The interviewees of the customers and partners of the case company were chosen due to their roles as key contact people between Wirepas and their companies. These interviewees have backgrounds in sales, marketing, and engineering.

The interviews made for this thesis are categorized between theme and open interviews. Theme interviews are commonly used in qualitative studies because they enable unexpected details to emerge more than a questionnaire would do (Hirsjärvi et al. 2014, 164). As presented earlier, some important themes were pointed out beforehand, but the interviews were more like dialogues. According to Hirsjärvi et al. (2014, 209), an open interview is most closely to conversation. An open interview also takes a lot of time and can require multiple times of interviews (Hirsjärvi et. al. 2014, 209.) For this thesis, the first round of interviews turned out to be adequate, and several main points were repeated in all of the interviews by the interviewees.

According to Taylor et al. 2016, 160), in qualitative research, data collection and analysis go hand in hand. The researcher is constantly trying to get important points out of the data by analyzing it during the whole process. Emerging themes and ideas are already examined from the first interview. At some point, this continuous analysis of the gathered data leads to a situation where no new themes are emerging.

That is when the data is saturated, meaning that the data collection is complete. (DiCicco-Bloom & Crabtree 2006, 314-315.) In this thesis, the data was proven to be saturated after eight interviews had been made. Section 4.2 will discuss the data analysis in more details.

When interviewing the employees of the company, a clear image of how the case company works today in marketing and what kind of ecosystem and customer base they currently have was gained. In addition, their opinions on what kind of role the IoT has in smart urban development and how business marketing is changed was asked. By interviewing the customers and partners, the purpose was to find out their definition for the concept of smart city and the role of IoT, what is the value they are getting from being a customer or partner of the company, and also what is the value they are bringing to the ecosystem. Their thoughts about possible changes in business marketing were asked, and they shared some key marketing tactics their company is using. It was also asked what they see as the most efficient B2B marketing tactics and channels in their industry in general. Finally, all the interviewees were asked how they would define interactive marketing and if they are using interactive marketing tactics actively in their companies' operations.

The interviewees were approached using email and the interviews were made during November 2018 separately with each individual. The conversations took mainly place in Skype, because of long distances and different time zones with some of the interviewees. The interviews were tape-recorded and transcribed into text carefully afterward. All in all, 50 pages of transcribed empirical data was gained during the eight interviews.

4.2 Data analysis methods

To be able to answer the research questions, a quite simple content analysis was adequate. The literature review of the role of IoT in smart cities and IoT ecosystems already gave some answers to the first two research questions, *how can IoT make cities smarter* and *who are the players in an IoT-based smart city ecosystem*. Content analysis was made to be able to answer the research questions based on the theoretical framework. In content analysis, the data is structured in a compact

written form after gathering it objectively and systemically. The idea in content analysis is usually to test previous knowledge in a new context, and the role of theoretical framework is to provide this previous researched knowledge. The logic here is deductive reasoning, which means that a conclusion is based on a general statement, which then leads to specific conclusions. The structure of the interviews created a framework for content analysis. (Tuomi & Sarajärvi 2018.)

Data analysis in qualitative studies is about “identifying themes and developing concepts and propositions” (Taylor et al. 2015, 160). By identifying the emerged themes, they can be structured based on their main topic. That helps to find certain viewpoints when analyzing the data. Themes in this thesis are identified based on the structure of the literature review and the asked interview questions. (Tuomi & Sarajärvi 2018, 105-107.) The process moved forward following the structure of the interviews, and the data was carefully reviewed by looking for relevant topics. The interviews were all different from each other, and in some cases, discussions on one topic included relevant answers to other questions as well. In addition to looking for similar themes in the data, also opposite views were very important notions.

Analysis of qualitative data can also include quantitative elements. Both quality and quantity can be present in both qualitative and quantitative research. (Mäkelä 1990, 57-58.) In the third part of the analysis where the interviewee’s opinions and experiences in business marketing were discussed, concrete marketing techniques were listed. Each of the technique was evaluated as *critical*, *high*, *medium* or *low* based on how many times they were mentioned as an effective marketing tool by the interviewees. Section 6.3 explains the evaluation method and how it was executed in more detail.

In academic research, the validity needs to be evaluated. Validity means if the research and the used methods are researching what was supposed to be researched. Validity also includes the generalizability of the research. (Hirsjärvi & Hurme 2014, 186-188.) What comes to the validity of this study, it needs to be noted that the questions about B2B marketing techniques in different companies and the interviewee’s opinions on what works and what doesn’t are subjective experiences of

reality and the ways their companies are handling their marketing, not an objective description in general. Hence, the research subjects are the interpretations, experiences, and meanings of the IoT professionals regarding IoT-based smart cities and business marketing, in these exact companies in this exact time. That means that this study cannot be done in another environment with other IoT professionals, waiting for the same results.

4.3 Case study: Wirepas Oy

In this thesis, a case study was made. The writer focused on a Finnish software company Wirepas Oy, and its ecosystem around smart cities and buildings. Wirepas is a Finnish software company operating in the field of Internet of Things (IoT). Wirepas is providing a software protocol Wirepas, which is a network enabling wireless IoT connectivity at massive scale. Wirepas' technology can be used on any radio hardware and on any frequency band, which makes it applicable for all large industrial IoT installations. Based on market studies, Wirepas estimated that in 2022 about 14 billion devices will be connected using non-cellular technologies. Out of those about three billion represent the addressable market for Wirepas. Wirepas is focusing on four IoT application areas specifically: smart metering, indoor and outdoor lighting, asset management and general sensing. Wirepas is focused only on industrial-grade, large IoT applications, not on small-scale consumer and home applications. (Wirepas 2019.)

In building smart and green cities, Wirepas Mesh can be used for example to optimize the consumption of electricity, water, and gas. By capturing information from millions of sensors, various smart city applications and solutions can be built: waste collection, smart parking, smart lighting, and pollution detection to name a few. Wirepas Mesh has no limits in scale, which means the network can cover a whole city. Different applications can be added into the same network, so cities won't be locked-in by any service provider by choosing to use Wirepas Mesh – it enables full independence to choose the best fitting application provider for each use case. (Wirepas 2019.)

Wirepas has a large partner ecosystem of companies that are key players in enabling smart urban development. The business model of Wirepas is based on licensing the software, Wirepas Mesh. Wirepas does not deliver any hardware, any physical product to its customers. Either the customers develop their own product, or they purchase the products from Wirepas' ecosystem partners. For its partners Wirepas can provide the most reliable, scalable, secure and simple to use connectivity technology for large scale applications. (Wirepas 2019.)

Wirepas is a Tampere originated company which was founded in 2010 as a spin-off from a research program at the Tampere University of Technology. The objective of the ten-year research program was to connect an unlimited number of battery-operated sensors. The original business model of Wirepas was to design, manufacture and sell sensor hardware which had Wirepas Mesh as the connectivity technology. In 2014 the focus changed, and the new strategy was based on the idea of focusing on software licensing and partnering with hardware vendors. Nowadays, Wirepas has almost 60 employees working globally. In addition to Wirepas' headquarters in Tampere Finland, the company has offices in Australia, France, Germany, South-Korea, India, Taiwan, the UK, and the US. The Wirepas team consists of experts from all over the world. (Wirepas 2019.)

Wirepas has a marketing team consisting of seven professionals. A Product Marketing team consists of industry experts for each segment Wirepas is operating in, and two people are responsible for Marketing and Communications in general. Sales are working closely with marketing, and teams support each others. Product marketing experts are introduced to prospects and customers to give even detailed information about specific industries, and the Marketing and Communications team is working closely with partners.

5. DATA ANALYSIS

This part of the thesis summarizes the collected data. The emerged themes are presented following the structure of the interview questions, and both the similarities and differences between each interview are pointed out. The main themes are the role of IoT in smart cities, value co-creation in smart city ecosystems, and marketing practices in these ecosystems. Anonymous direct citations are used to present some of the most important points emerged during the interviews. Some of the citations are cut with hyphens (- -).

In the following sections, the gathered data is presented following the themes that emerged during the discussions. In section 5.1, the focus is on the concept of smart cities and the role of IoT, discussing also the sustainability and challenges of smart city development. In section 5.2, the ecosystem value perspective is presented separately from the viewpoint of the case company Wirepas, the partners and customers of Wirepas and the city representative. Section 5.3 deals with B2B marketing, analyzing the practices and the ways marketing has changed during the past years. Chapter 6 discusses the data analysis in more detail and views the themes through the theoretical framework of this thesis.

5.1 The role of IoT in smart cities

When describing their views of what smart city is, a few themes were repeated by most of the interviewees: capturing and measuring larger amounts of data, decreasing costs, increasing inhabitants' wellbeing in cities and enabling remote access to devices. All the interviewees brought IoT, the need for wireless data capturing, in the discussion when asking them about smart cities in general. Two of the interviewees had more technology-focused approach than others, who highlighted the importance of the citizens and their needs when developing smart city applications. One of the interviewees summarized this very well when discussing smart cities and what the concept actually means:

“From my point of view, the starting point is recognizing the environment – the people and companies in the city, what kind of city it is. Because not all the cities are identic. There is no one generic smart city concept that could be cloned to all the cities. All the cities have their own DNA.”

Another interviewee described this by highlighting the role of the smart city in serving its users, inhabitants, better. The outcome of developing a smart city should be to ease inhabitants’ lives, make them happier and helping the government to manage the city efficiently by still reducing costs. IoT-technology is seen as an enabler for this by gathering useful data:

“It’s about how can technology be used to ease people's existence in large urban environments.”

“What IoT brings is the ability to capture a larger amount of data about a given space... - - It might be how the space is used, how many people are in this meeting room, or how many people are in this square in the city. How many people are taking that bus, where are they going, what are the transportation flows. Because from that you can derive insights regarding how to optimize and make that more efficient.”

As mentioned earlier, two of the interviewees kept their scope highly technology focused. These interviewees were strongly focusing on the needs of IoT from government’s and business perspective. They were highlighting the improvements IoT-based smart city development, and how IoT can bring significant benefits regarding the use of resources when managing and maintaining cities’ activities and services, and the decrease of costs. However, it needs to be pointed out that these points were emerging from most of the other interviews too, the strong focus yet being on serving the inhabitants better and easing their lives. One interviewee particularly mentioned the problem of smart city discussion being too technically oriented:

“Of course, technology is a very important element. When utilizing technology, these things can be made. But when thinking about this from a wider perspective, I see smart city as a digital layer on top of the physical city.”

In a few interviews, sustainability played an important role when discussing smart cities. It was mentioned, that the ability to capture more real-time data allows cities to gain meaningful insight regarding how cities can be made more sustainable from energy consumption and transportation perspective. It was highlighted, that IoT can help cities and people to be more careful with resources that they use, to sustain the way of life. It was also recognized, that the sustainability of IoT is not yet very widely researched theme. Even though it was mentioned a few times that IoT can have a significant role in making the world more sustainable by for example reducing energy consumption by switching of the street lights when no one is on the street, on the other hand it was mentioned that also transferring and saving the data consumes energy. It was highlighted by one of the interviewees that also the stand-by mode of the street lights, for example, increases the costs in energy consumption, but when optimizing the consumption, the best possible way the city eventually saves money, provided that the gathered data is utilized efficiently. If the data is not used properly, the solution will not save any costs or energy.

Most of the interviewees pointed out that both smart city and IoT can have various definitions, and that the definition of IoT also depends on the concept. Also, a platform perspective was mentioned a few times. It is seen as the basis for smart city development, that different kind of measurement and sensing devices can be added in the same, for example, street lighting, network.

”Smart city is a real smart city when it’s not just a collection of different IoT-applications, but rather a one big system consisting of all these applications that are linked to each other.”

The challenges of the concept of smart city were discussed with the city representative during the interview. It was pointed out that one of the biggest challenges is the attitude of the people involved. Other significant challenges are the lack of technical know-how and the bureaucracy of the public sector.

“A fear of losing a job, or changes in work tasks so that the employees couldn’t cope with the changed expectations.”

“At the moment, the city doesn’t have the know-how that these smart city and IoT-applications need. It is challenging for us to compete for employees when we don’t necessarily have the possibilities to offer the same pay for their work than some others might have.”

“... - - Since these are public sector’s actions, it takes time. - - People tend to get fed up with it [smart city development] before any concrete actions start to happen.”

Different ways have been tried to tackle these challenges. The city of Tampere has been piloting new possible functions and technical platforms with the employees whose tasks are likely to change. This way the employees are able to test the systems and functions beforehand and contribute to the development by telling if the systems and functions are useful or not.

One other thing that was mentioned by many of the interviewees was that the development towards being smarter has been happening in many cities for a long time already. There are different views on what is smart, and when a city is an actual smart city. It was mentioned, that smart city is often said to be something that is just about to start, a trendy concept that is now implemented in all around the world, when the reality is that this type of development has been happening little by little over the past few decades, without having the fancy concept of smart city development connected to it.

All in all, most of the interviewees saw the concept of smart city as a citizen-oriented approach where IoT is the enabler and brings the ability to capture a larger amount of data about a given space, which then can be used to make citizens lives better and cities more sustainable. Platform thinking, building an IoT network structure around street lighting for example and then linking other applications to the same network, was seen as the basis for smart cities. Certain challenges were identified, one being the lack of technical know-how in cities and therefore also people’s attitudes towards changes. The sustainability of IoT got attention from many of the interviewees, and there was a common understanding of both the concept of smart city and IoT being ambiguous concepts with many definitions. It was also

recognized, that the technical background of some of the interviewees did not seem to have any impact here – the interviewees with strongly technically oriented focus were actually the ones with the least technical background what comes to education and career history.

5.2 Value co-creation in IoT-based smart city ecosystems

When taking the ecosystem perspective to smart cities, the interviewees emphasized the development being cooperation of multiple different actors. The key point is that different actors are delivering a different kind of value in the value network.

“I don’t believe in creating a higher-level architecture led by one actor, a city in this case. This will be a smart network, and smart city will be a combination of hundreds or even thousands of different actors working together.”

From the city’s perspective, multiple actors were listed: all the actors and people inside the city, stakeholders, public utilities, companies, foundations, universities and research institutes of the city. In addition to these, different types of companies are taking part: consultants, solution providers and contractors for example.

From Wirepas’ point of view, the ecosystem around smart city applications is built around these system providers working with cities, who are partnered with Wirepas to use Wirepas Mesh technology in their own products, or in the products a partner company is manufacturing, and they are delivering these products as a part of a complete solution. To be part of the smart city development, a partner ecosystem is needed. There needs to be someone to manufacture the physical device, someone to provide the back-end analytics, and Wirepas to provide the connectivity software. The challenge here is to understand the motivations of the whole value chain – the end user but also the people that are taking the software into use.

“So typically, we’re providing our software to people who are making sensing devices. From a smart city perspective that could be air quality monitoring, it might be movement sensors, and on the other hand, it can be devices to

actuate street lighting for example. So those are our direct customers, but they are selling to municipalities.”

When thinking about the value created in the ecosystem, different kinds of created value was identified. When the case company Wirepas is providing the large scale IoT-connectivity to enable data gathering, other companies in the ecosystem are focusing on other parts of the value chain: some are manufacturing IoT devices like sensors, for example, some are providing back-end analytics for gathered data, some are bringing together all this and are selling ready-made IoT-solutions to their customers. All these values are essential for the end user so that a complete IoT-solution can be created.

“From Wirepas’ ecosystem point of view, we are in a different part of the value chain - - ...we fulfill the ecosystem with our offering. Even though we don’t directly utilize Wirepas’ technology... - - ... but from the perspective of IoT-device manufacturers, we are bringing an element which is not competing with their products. We are solving a big problem in creating the application for the end user [providing the back-end system].”

“Wirepas is a very important building block in this solution offering because they are offering a very good, and I think very suitable for smart city network, mesh network technology, that is scalable not only in the number of nodes but also in different applications like smart lighting, parking sensors, and environmental sensors. The fact that you can connect everything together in one network with Wirepas Mesh really opened our eyes and we see that they are one of the strongest partners of our offering.”

It was also highlighted a few times that the value that Wirepas brings is specifically value for large scale IoT installations, where a connectivity technology that can scale and go to very high densities is needed. Other values that Wirepas Mesh can bring are affordability, reliability, and easy installation.

One thing that came into discussions was the advantages of joint marketing in the ecosystem. A global company like Wirepas can give smaller Finnish partner

companies more visibility all over the world and marketing a cooperatively made solution with an IoT device manufacturer gets more attention at trade shows for example, where the software and hardware provider are exhibiting together.

“Also, the fact that we are a Finnish company partnering with other Finnish companies is a valuable asset. Finnish know-how in technology is well known and respected, and the story of these Finnish companies combining their forces to provide the best solution is a great story to be told. - - We have an ecosystem story that helps us to stand out from other providers.”

All in all, different parts of the value chain were recognized. It is depending on the company's technological focus, whether it is a hardware, software or a complete solution, in which part of the value chain a certain company is standing. Also, how the companies see the structure of the ecosystem depends on the company and their offering. Delivered value can also be different for each company. From end user's perspective, all parts of the value chain are essential to be able to have a complete IoT-solution.

5.3 Marketing in IoT-based smart city ecosystems

According to all interviewees, B2B marketing, especially marketing channels and tools have changed during the past years. The common themes repeated by most of the interviewees were increased use of social media and the importance of traditional face to face meetings. Overall, human to human contact was seen as an essential part of business marketing. It was repeated multiple times that all the communication and relation building is based on relationships, typically between two individual people – the company representative and the first contact from customer or partner company.

It was also pointed out that the used B2B marketing channels might vary depending on the product or service a certain company is providing to its customers. When talking about a high-tech product, a software protocol Wirepas Mesh, for example, the key purpose and a challenge of B2B marketing is to clarify the marketing message and to target the message to the right audience. It needs to be clarified what is

provided and more importantly, what kind of problems the provided product or service can solve.

“In my opinion, the most important mission of B2B marketing is to sharpen the marketing message from the massive amount of data to a concrete message which tells what we can do in practice, and what kind of customer use case examples can help to better understand how it [product or service] can be utilized.”

Two of the interviewees particularly highlighted the different meanings of information and data. All the companies are pushing massive amounts of data into various channels, from which the real information can sometimes be hard to be understood.

It was mentioned a few times that B2B marketing has adopted the usage of social media from consumer marketing, where social media channels have been one of the most used marketing techniques for a long time already. One key thing is using LinkedIn, a business-oriented social media, actively in marketing. These types of channels for businesses didn't exist in the past and they have enabled the usage of social media in business marketing all over the world. One key point here is that even though companies have business accounts in LinkedIn and Twitter, for example, the employees are representing the companies they work for as individuals too.

“I believe B2B marketing is not a classic company to company marketing anymore. It has evolved so that companies understand that even though you're marketing your product or service to another company, the decision maker in that company is a person. If we think about social media marketing for example, when you advertise your product in LinkedIn you need to get attention from the people in a personal level, and not only focus on the company that person is representing. All in all, social media has made the thinking of 'we are B2B marketers' old-fashioned.”

In addition to LinkedIn and Twitter as social media channels, a few other channels and tactics were mentioned: e-mails, trade shows and other events, marketing

automation, webinars, traditional paid advertising which was mentioned to be mostly online, chat on company's website, e-commerce, public website information including video material, call-to-actions on website, joint marketing in ecosystem and phone marketing. It was also mentioned, that tools gathering data from customers and prospects are an essential part of marketing. Tools mentioned were a marketing automation tool HubSpot and CRM (Customer Relationship Management) platforms in general. It was also highlighted, that knowing people and simply networking is a valuable asset. Table 3 summarizes the mentioned marketing channels and tactics categorizing them into six different groups.

Category	Activities/techniques/channels
E-mailing	Campaigns, marketing automation
Events	Trade shows, company events
Social Media	LinkedIn, Twitter
Other online	Webinars, podcasts, videos, traditional paid advertising
Website	Public website, product configurator, downloadable material, contact us -form, other call to -actions, e-commerce, chat, marketing automation
Networks & ecosystem	Face to face meetings, knowing people, ecosystem, partnering with companies

Table 3: B2B marketing channels in the IoT industry

Separate marketing techniques mentioned during the interviews are listed in table 4. Each of the technique is evaluated based on its importance in business marketing in the IoT industry. The priorities are set based on the interviews as follows: *Critical* stands for techniques that were mentioned as important and useful during the interviews by more than four interviewees. *High* stands for techniques mentioned as important by 3-4 interviewees. *Medium* stands for techniques mentioned as important by 1-2 interviewees. If a certain technique was said to be useless or even a total no go and none of the interviewees mentioned it as an effective marketing technique, the importance is set as *low*.

Marketing technique	Importance
Social media (LinkedIn & Twitter)	Critical
Trade Shows	Critical
Website – public information	Critical
Joint marketing in ecosystem	High
Website – contact form	High
Website – downloadable material	High
Company events	Medium
Podcasts	Medium
Search engine optimization (SEM)	Medium
Webinars	Medium
Website - extranet	Medium
Website – product configurator	Medium
E-commerce	Low
E-mail campaigns	Low
Traditional paid advertising	Low
Phone marketing	Low
Website - chat	Low

Table 4: B2B marketing techniques evaluated based on their importance in IoT industry

Even though online channels are now replacing traditional ways of marketing, it has some downsides too. Reaching people and getting them to read, watch or listen to your marketing messages online is a challenge due to high competition. It can be said, that in some channels a dilution effect has happened. This again refers to the problem of having too much data out there which then confuses people, which leads to the situation where the real information doesn't reach the target audience.

“Let's take email as an example: it is an almost free of charge way to distribute information for a large group of people. But then, because it is free, everyone is using it. What happened is that everyone started to push newsletters and advertisements through email to massive groups of people all around the world. It leads to the situation where one person receives 50 marketing emails

a day when the outcome is that they are not read anymore. More and more companies and individual people are blocking marketing emails completely.”

Overall, none of the interviewees saw emails marketing as an effective way to execute marketing, which can be seen in table 4 as well.

As mentioned in section 5.2 joint marketing in the ecosystem was seen as a very valuable and effective way of marketing. In addition to attending trade shows together with partners and publishing press releases and campaigns together, it was mentioned that companies might come to other companies saying that they heard positive experiences from a third company and want now to work together. So companies might get interested when they hear positive things about a certain company from someone they trust.

The last question that was asked from the interviewees was how they see interactive marketing being part of their operations and what does it mean to them. Most of the interviewees struggled with the definition of the concept and weren't sure what it meant. Many of the interviewees seemed to think that being interactive in marketing requires some kind of special tools and marketing techniques and deeper knowledge of interactive marketing. There were a few interviewees who mentioned some ways of being interactive in marketing, using website call to actions as examples. Overall, they described interactive marketing as a way to include customers into marketing and engaging them through that.

Overall, the common viewpoint of all the interviewees was that the tools and channels used in business marketing have changed significantly, but the core stays the same: people buy from people, and the same marketing message has to be delivered to the people working in target companies.

“B2B marketing has evolved tremendously. I think that there are a lot more tools to be used, but one thing does remain the same: At the end of the day, people buy from people they trust. And you don't necessarily establish a trust relationship through a social platform like LinkedIn or Twitter. It comes down to individuals sitting across the table. So, things have changed a lot, but

fundamentally human nature hasn't. Which is, you buy from people you trust. You can establish trust of the brand online, but the end of the day it requires a handshake to make it happen.”

6. DISCUSSION

This chapter answers the research questions based on the empirical data and views the analyzed data through the theoretical framework of this thesis, which was presented in chapters 2 and 3. The empirical data was partly fulfilling the information captured during the literature review by proving some marketing and business ecosystem related theories to be applicable in IoT industry around smart cities, and on the other hand, it gave new definitions to some of the concepts presented in the theoretical framework. The empirical data provided a more concrete concept to the IoT-based smart city ecosystem structure, and different parts of the ecosystem and the value they create were identified. A concrete list of mentioned marketing techniques was made during the data analysis, and the techniques were categorized as *critical*, *high*, *medium* and *low* based on their importance for business.

This chapter presents the empirical data through the lenses of the theoretical framework of IoT-based smart city ecosystems and B2B marketing. The chapter follows the structure of the literature review and the analysis of the empirical data, separating the themes into three sections: IoT-based smart cities, value co-creation in business ecosystems and B2B marketing.

6.1 Smart cities – IoT-technologies increasing inhabitants wellbeing in urban areas

According to Atzori et al. (2017, 135-136), IoT is not one technology but a concept of integrating several different technologies to transmit data from different sources. Abella et al. (2015, 839) are stating that smart city is “a public-private ecosystem providing services to citizens and their organizations with the strong support of technology”. IoT can be defined as a network of devices communicating with each

other wirelessly, the key function being automatic wireless data transportation between these connected devices (Rathore et al. 2016, 65; Zanella et al. 2014, 22). When utilizing this real-time data efficiently, cost, energy, water and gas savings and positive impacts on citizen's lives can be made. The empirical data of this thesis shows, that professionals working in the field of IoT around smart cities tend to link IoT to smart city discussions automatically. The analysis of the empirical data gathered for this thesis confirms large scale IoT being an enabler in developing smart cities. It also shows that IoT is not one technology, but integration of many technologies working together to provide a complete solution. Even though Albino et al. (2015, 4) and Yigitcanlara et al. (2018, 157) state that there is no common understanding on what a smart city means, in this thesis, all the interviewees saw the concept of smart cities in a similar way.

The analysis shows, that usually the concept of smart city is seen as a citizen-oriented approach. It is understood, that IoT-based smart cities are developed as a solution for challenges caused by rapid urbanization. As Maclaran (2014, 1-4) presents, the demands towards cities have increased and now cities need to change as well in order to manage the ways people are living. This is exactly what the empirical data of this thesis is showing, that smart urban planning is a solution for these problems. Abella et al. (2015, 839) and Anttiroiko et al. (2014, 325) are also highlighting the importance of human capital in developing smart cities. However, an interesting notion is that the literature about smart city development is usually either very technically oriented or then the opposite, focusing on smart city development from the city's and citizen's perspective and leaving the technical approach less covered. The analysis of the empirical data for this thesis shows, that both approaches need to be researched and considered when developing smart city applications. It is also said that the concept of smart cities has been criticized due to its very technical orientation (Neirotti et al. 2014, 26). The empirical data of this thesis proves that not only governmental actors tend to think so, but also IoT professionals are recognizing this. On the other hand, the representative of the Smart Tampere project mentioned that the lack of technical know-how inside the city organization is one of the biggest challenges in developing smart city. Also, Anttiroiko et al. (2014, 325) and Yigitcanlara et al. (2018, 146) state that the deployment of technical smart city solutions would need the city councilors and stakeholders to be

technically oriented enough to understand the possibilities and different options to choose from. That being said, both the human capital and technology focused approaches are both needed..

The starting point for any smart city application is building a platform. It refers to building central technology networks, which can then work as platforms for other smart installations. Using these platforms, different parts can be integrated, and different things can be measured. (Abbate et al. 2018, 2-3.) The empirical data of this thesis shows that both IoT professionals and the city of Tampere agree with that. For smart cities, a smart street lighting installation is usually the starting point.

One theme that gained more attention than expected during this study was the sustainability of IoT. As stated earlier, some researchers are presenting the idea of smart cities as a synonym for sustainable cities (e.g. Ahvenniemi et al. 2017), but Yigitcanlar and Kamruzzaman (2018, 57) state that “there is little empirical evidence that, despite its promise, smart cities contribute to sustainability agenda”. The empirical data of this thesis shows that the sustainability and IoT go hand in hand. No smart city solution is key to sustainability alone – IoT is about gathering lots of data from different sources and devices, and the main point is to use the gathered data efficiently.

6.2 A complete IoT-solution needs all parts of the value chain

According to Day and Moorman (2010, 25), customer value composes when the perceived benefits of purchasing a certain product or service are greater than the total costs of obtaining the product or service. In this thesis, the value for IoT ecosystem’s end customers in smart city applications is a complete working smart solution where the main benefits are reduced costs, saved environmental and human resources, and increased wellbeing of citizens. Total costs of obtaining these solutions include the money paid for deployment, maintenance, and support, and also the time consumed finding the right solution and provider and setting a solution up. Day and Moorman (2010, 25) are also adding psychological costs of learning to use a new product to the category of total costs of obtaining the product or service. Based on the interviews, this psychological cost is relatively high for cities. For

partner companies, the value received from the case company Wirepas is a reliable, scalable and easy to use wireless connectivity which can be used in the products or solutions the partners are providing to their customers.

Rong et al. (2015, 53) are using a concept of IoT-based business ecosystem referring to business ecosystems around IoT-companies and customers. These ecosystems are complex networks consisting of different stakeholders who can contribute to business and value co-creation in business ecosystems. The empirical data shows that different actors of the ecosystem are creating different types of value, both to other companies in the ecosystem and to the end customers. There are multiple different models created for IoT-based business ecosystems, one being a simple model by Rong et al. (2015, 52) consisting of three main parts: the network of companies providing the platform, the product or service and the customers or stakeholders who get feedback from the product or service. When analyzing the empirical data of this thesis, the main parts of IoT-based business ecosystem were identified: device manufacturers, connectivity providers, back-end-analytics providers, system integrators and end customers. Figure 5 shows how these players are interconnected and what is the value they are bringing to the ecosystem from the smart city ecosystem's end customer's point of view.

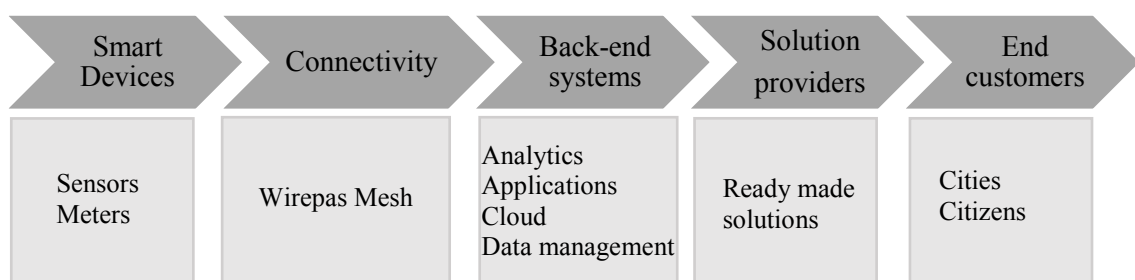


Figure 5: Smart city IoT ecosystem of Wirepas Oy

During the literature review, one notion that was made was that there is a surprisingly large amount of studies about business ecosystems leaving customers completely outside of the ecosystem thinking. When analyzing the empirical data of this thesis and reflecting it through the literature review that was made, it can be stated that one of the most important parts of every business ecosystem are the customers.

The pioneer thinker of business ecosystems, James. F. Moore also introduced customers as one of the key players and essential parts in business ecosystems (Moore 1996). Joo and Marakhimov (2017, 2; 4) are also highlighting customers as co-creators in business ecosystems by consuming products and services. Based on the empirical data, it can be stated that customers appear in different stages of the ecosystem. There are the end customers, but in between, there are multiple customer-provider -relationships before the complete solution is provided to the end customers.

As Abellá-García et al. (2015, 1075), Mukti & Prambudia (2018, 5) and Visnijić et al. (2016, 136) state, smart city ecosystem consists of actors that are working together towards developing smart cities. These actors are citizens, companies, organizations and city managers. Inside one smart city ecosystem, there can be multiple smaller ecosystems. The empirical data of this thesis is gathered from one of these smaller ecosystems consisting of companies enabling complete smart city IoT-solutions together. Figure 6 shows how the case company Wirepas and its ecosystem around smart cities are represented in the smart city ecosystem model made by Mukti & Prambudia (2018, 5.)

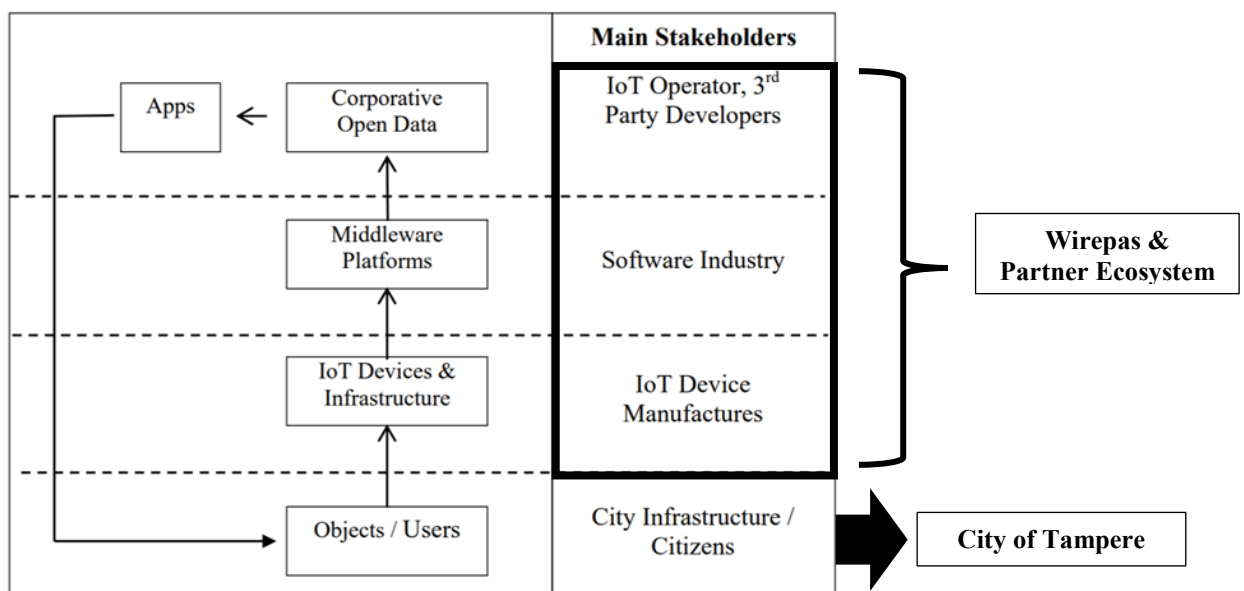


Figure 6: Wirepas smart city ecosystem (adjusted from Mukti & Prambudia 2018, 5).

These two models of IoT-based smart city ecosystems (figures 5 and 6) can be created when considering what was stated earlier: inside one business ecosystem, there can be multiple smaller ecosystems. From a city's perspective, the ecosystem is more complex. The empirical data of this thesis shows, that from a city's perspective these players in the ecosystem are all the actors and people inside the city, stakeholders, public utilities, companies, foundations, universities and research institutes of the city. In addition to these actors, different types of companies are taking part: consultants, solution providers and contractors for example. The business ecosystem structure presented by Moore (1996, 26) takes all these actors into account and is referring to coevolution process when creating value in a business ecosystem. Coevolution means cooperating and bringing innovative players together, which can then deliver better or more complete value to their customers. He also states that value creation in the ecosystem is one of the first steps in the coevolution process. (Moore 1996, 69-71.) In Wirepas' ecosystem, these different actors of the ecosystem are constantly cooperating, each providing their own part to the value chain to enable to deliver complete IoT solutions to end users. The empirical data shows, that it depends on the company's technological focus, whether it is a hardware, software or a complete solution, in which part of the value chain a certain company is standing. It can also be stated that all parts of the value chain, or value networks as Kotler and Armstrong are referring to (2010, 17), are essential to be able to have a complete IoT-solution.

When considering Moore's theory of business ecosystems and applying it to the IoT ecosystem thinking around smart cities, a complete model of an IoT-based smart city ecosystem can be created. The model combines the empirical data of this thesis and the theories of business and IoT ecosystems. Figure 7 shows how the ecosystem is built as a whole.

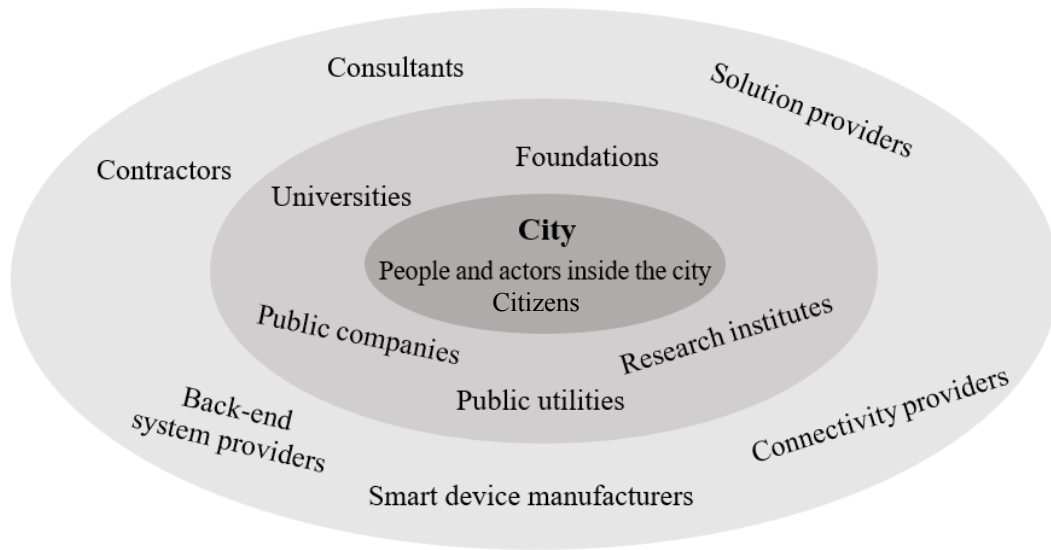


Figure 7: IoT-based smart city ecosystem

The inner circle presents the city: people and other actors operating inside the city organization, including the city employees who are the ones utilizing the gathered data in the end. Based on Moore's (1996) theory of business ecosystems and Joo and Marakhimov's (2017) theory of IoT ecosystems, it is reasonable to place citizens, the final end customers of smart city applications, in the inner circle of the ecosystem model. The second circle contains other city stakeholders: Research institutes and universities, public utilities, public companies, and foundations. The outer circle presents companies enabling smart city application development: all the parts of the IoT value chain which were presented earlier, although solution providers are usually the ones operating directly with the city. However, as stated earlier, a complete solution cannot be provided without the value gained from other companies in the ecosystem. In addition to the IoT ecosystem consisting of different companies, the outer circle presents other actors involved such as contractors and consultants.

The empirical data also emphasizes the importance of partnering with other companies to gain a better position in the market. Joint marketing and sales actions with other companies inside the ecosystem are seen as very valuable. Kotler and Armstrong (2010, 72) are also stating that nowadays competition takes place between entire value delivery networks, or ecosystems, rather than between individual competitors. When reflecting this to the empirical data of this thesis, it can be stated that

competition happens towards the end customers, cities in this case. Cities are usually buying from solution providers, and a solution provider that has Wirepas Mesh as a connectivity provider is a part of Wirepas' ecosystem.

6.3 The core of business marketing is human-to-human contact

As stated earlier, discussions of the business marketing being more and more similar to consumer marketing have been ongoing in businesses and academic papers (e.g. Gummesson & Polese 2009; Kemp et al. 2018, Pandey & Mookerjee 2018). The empirical data of this thesis shows, that separating B2B and B2C marketing strictly is old-fashioned and that B2B companies are increasingly using B2C tactics in their marketing practices. As Kotler and Armstrong (2010, 49-51) state, digital transformation has made the world and people more connected than ever before and has created completely new marketing channels and ways of marketing. The IoT professionals interviewed for this thesis agreed with this, and a common statement was that business companies are currently using more social media than they used to before. Also, it was said that even though both B2B and B2C are now utilizing social media heavily in their marketing, the channels for B2B are different. LinkedIn and Twitter are seen as very valuable in business marketing when consumer marketing is mostly focusing on Facebook and Instagram what comes to social media marketing.

One other aspect that came up during the analysis of the empirical data of this thesis was business marketing sometimes being more targeted than consumer marketing. For example, everyone goes to grocery stores and is a target for food commercials, but not all companies need a large scale IoT connectivity solution. That also affects the channels that are used. Although Iankova et al. (2018, 9) state that B2B marketers are using different channels in social media marketing than B2C companies because business companies may be more concerned about the risks of social media, it can be stated that the main factor here are the target customers and the challenges of reaching the right target audience through the right channels.

Digital marketing is the fastest growing marketing form nowadays, and information and other digital technologies have enabled completely new ways to track target customers and execute marketing in new channels (Kotler & Armstrong 2010, 49-51). The Internet has also grown the power of customers and customer communities. Customers tend to go for what is trendy, and what others are buying. The empirical data of this thesis highlights the importance of word-of-mouth, which means marketing initiated by customers to other customers. When a certain customer has positive experiences about a certain product or service provider, they are most likely to recommend them which leads to other people getting interested in that provider too. This is exactly what the interviewees of this thesis were telling when talking about the effect of networking, partnering and knowing people in the business market – people buy from people they trust.

Overall, based on the interviews and on what Brennan et al. (2007, 42) and Kotler & Armstrong (2010, 199.) stated, it can be argued that personal factors play a significant role in business buying. Even though companies are selling to other companies, they are the individual people whose attention they need to get. It is reasonable to state that B2B marketing is all about human-to-human contact.

Human-to-human contact is the key in interactive marketing, which can be defined as a modern form of direct marketing. The key feature of interactive marketing is a two-way conversation between the company and its targeted customers. Interactive marketing can use many different types of media and channels, but during the past few years, the focus has strongly been in digital marketing. (Aslam et. Al. 2015, 27; Dushyenthan 2012, 57; Ryan 2004, 20-21; Stone & Woodcock 2013, 4.)

Based on Barwise and Farley's (2005, 73) table of interactive techniques and on Spiller and Bayer's (2010, 177; 215-216) and Ryan's (2004, 110-111; 212-228) discussions on interactive marketing techniques, a complete list of techniques was created when combining the theory and empirical data. During the analysis of the empirical data, each mentioned technique was evaluated based on their importance for business. Table 5 takes the same approach but adds the level of interactivity to the table based on Ryan's (2004, 11) four levels of interactivity which were presented in subsection 3.4.2. To give a quick recap on the levels of interactivity, level

four stands for direct person-to-person contact between a prospect and a company. Level three presents interaction with an electronic system, and in level two tools for responding are provided and the marketer wishes for instant feedback. Level one stands for image ads for example, where no interaction is expected to happen. The three last techniques with importance set as “no data” stand for techniques emerged during the literature review but which were not mentioned in the interviews. Therefore, their importance in IoT industry can’t be evaluated.

Marketing technique	Importance	Level of interactivity
Social media (LinkedIn & Twitter)	Critical	3
Trade Shows	Critical	4
Website – public information	Critical	2
Joint marketing in ecosystem	High	4
Website – contact form	High	3
Website – downloadable material	High	3
Company events	Medium	4
Podcasts	Medium	2
Search engine optimization (SEM)	Medium	1
Webinars	Medium	3
Website - extranet	Medium	2
Website – product configurator	Medium	3
E-commerce	Low	3
E-mail campaigns	Low	2
Traditional paid advertising	Low	1
Phone marketing (calls)	Low	4
Website - chat	Low	3
Website - extranet	Low	2
Phone marketing (SMS)	No data	2
Interactive TV	No data	2
Virtual reality	No data	4

Table 5: Interactive marketing techniques evaluated based on their importance in the IoT industry and level of interactivity

Table 5 shows that the three most critical techniques, social media, trade shows and public website all include interactivity at some level. Public website, which according to Ryan (2004,11) can be said to fall into level two in interactivity, was seen as one of the most important values bringing marketing tactics for all IoT companies. Especially companies offering high tech products and solutions need to have clear public websites where relevant information can be understood easily. Trade shows and exhibitions were seen as an important way of marketing companies and their products and services, and it was stated that sometimes just being there is important to show you are part of the industry. Joint marketing in ecosystem and call to actions on the website were all set as highly important, and the level of interactivity varies between three and four. Call to actions in the website include interaction with an electronic system at first if marketing automation is used, but initially, it leads to human-to-human contact by email, phone or even face to face. Therefore, it can be stated that the level of interactivity raises to level four when going further.

The interactivity level of techniques evaluated with importance medium varies from level two to level four. Company events are seen important because they include direct human-to-human contact. Podcasts and webinars fall into the same category of techniques practiced online, but webinar gives attendees possibilities to ask questions when podcasts are more passive. Having a product configurator at a website was seen important according to some of the interviewees, and the interactivity level is set as three since it's providing interaction with an electronic system. However, as well as with contact forms and downloadable materials, this might lead to human-to-human contact later. Providing an extranet for registered users at a company's website can include these functions too – downloadable material could be behind the gate so that one needs to register before getting any technical documents for example. Search engine optimization (SEM) was said to be one of the most important basic things in any marketing so that other companies and people can find your products or service when looking for something similar on the Internet.

E-commerce, e-mail campaigns, traditional paid advertising, phone marketing and chat at a website were not seen important by any of the interviewees and they were rather described as useless, or even total no goes. E-commerce was said to be

challenging in large scale IoT industry where use cases vary so much, the same applying for website chat. It was said that a chat robot couldn't handle the questions about use cases that can vary a lot and putting a real person behind the chat would cost too many resources. SMS marketing, interactive TV and extranet were not mentioned during the interviews but emerged when making a literature review on interactive marketing. Especially the possibilities of virtual reality in business marketing are something that needs more future research.

Based on table 5, it cannot be stated that the level of interactivity alone would make a certain marketing technique effective, but it can be seen that the techniques evaluated as most important in IoT industry have a generally high level of interactivity included. Not all the interviewees were sure what interactive marketing is or if it is something worth practicing in business marketing, but all of the companies are already utilizing interactive marketing techniques in their marketing operations.

Overall, it can be stated that the tools and channels used in business marketing, especially online channels, have changed significantly. However, the core stays the same: people buy from people, and the same marketing message has to be delivered to the people working in target companies.

7. CONCLUSIONS

This part of the thesis summarizes the study into one chapter by reviewing the four research questions presented earlier, answering them and then giving a final conclusion for the initial research problem. In addition, this chapter clarifies the results and practical implications, presents the limitations of the study and gives some suggestions for future research.

7.1 Thesis summary and practical implications

This thesis answers four research questions:

1. How can IoT make cities smarter?
2. Who are the players in an IoT-based smart city ecosystem?

3. How do different actors contribute to value co-creation in IoT ecosystems?
4. Which are the tactics to reach B2B audience in IoT industry?

The writer approaches the first questions by making a literature review of these topics and then collects empirical data from 8 IoT professionals. The empirical data for research questions one and two is mostly confirming and completing the theories presented in the literature review. Based on this thesis, the concept of smart cities is seen as a citizen-oriented approach where IoT is the enabler in developing new, smart solutions that ease peoples' lives in urban areas, reduce costs, optimize the use of water, gas and electricity and resources by enabling cities to plan preventive maintenance activities. IoT-based smart cities are a result of implementing smart urban planning, which is needed to tackle the problems cause by rapid urbanization.

Different parts of the IoT-based smart city ecosystem were recognized, and it can be stated that no company or organization can develop a complete smart city application alone – a complex value network consisting of companies operating in IoT ecosystem is needed, and all parts of the value chain are critical. The main parts from the perspective of IoT business ecosystems are device manufacturers, connectivity providers, back-end-analytics providers, system integrators and end customers. From the city's perspective, more significant players are taking part, such as research institutes and universities, public utilities, public companies and foundations, contractors, consultants, and of course the city and citizens itself. All these parts are needed in order to create IoT-based smart city solutions.

A complete list of business marketing techniques was presented in section 6.3. The list presents all the techniques which emerged during the literature review and analysis of the empirical data, and all the techniques are evaluated by their importance and level of interactivity. The analysis of the techniques shows that interactive marketing techniques are needed in order to reach the target audience. Interactive Internet-based activities are seen as most important, including social media which in business marketing means mainly LinkedIn and Twitter. Other very important interactive marketing techniques are joint marketing with other companies in the ecosystem and networking in general and being present at various trade shows

meeting people. All this is based on maximizing human-to-human contact and presence in social media. The role of website is seen very important, and different call-to-actions on websites are presenting an efficient way to implement interactive marketing techniques in digital marketing. All in all, digital marketing channels are seen important but it can be stated that marketing can't be based on digital platforms only – a real human to human interaction is the key.

Now when the four research questions are answered, a final answer to the initial research problem is to be presented. The research problem in this thesis was *what is the role of interactive marketing in IoT ecosystems around smart cities?* More specifically, in the part of the ecosystem that consists of IoT companies enabling and providing smart city solutions for cities. This thesis, combining a large review of relevant academic literature and empirical data gathered from 8 IoT professionals by interviewing everyone separately, presents interactive marketing being a critical marketing tool in building IoT ecosystems which are the enablers of smart cities. The thesis shows, that without these IoT ecosystems consisting of companies each bringing their own value to the ecosystem, smart city solutions cannot be developed. It is shown, that ecosystems are appearing in different levels: smaller ecosystems can emerge inside larger ecosystems. In this study, the smaller ecosystem inside the complete IoT-based smart city ecosystem is the IoT-ecosystem of the case company Wirepas, which consists of IoT companies each providing their own part to the value chain.

This thesis contributes to the literature in two ways. The first contribution is to the IoT-based smart city and business ecosystem literature by presenting an IoT-based smart city ecosystem model where the city and citizens are in the center, and all parts of the ecosystem are considered. This model also introduces customers of private B2B companies as key players and parts of IoT-based smart city ecosystems. The second contribution is made to the marketing literature presenting interactive marketing as a successful strategic tool in B2B marketing in the technology industry. A list of marketing techniques evaluated by their importance and level of interactivity is presented, which can be valuable information for companies operating in the field of IoT.

The results are presented as guidelines for smart city ecosystem players, more specifically to companies operating in the area of IoT. Other results of this thesis can be used to gain a wider understanding of how the IoT is changing cities and what kind of possibilities it is providing in smart urban planning. Results related to ecosystems can be used to widen the understanding of business ecosystems in technology industry especially in the field of smart cities. For the case company, this thesis provides some useful information on how certain marketing techniques are seen in their smart city ecosystem. This enables their marketing operations to evaluate their practices and to see if some of the techniques that are not currently used should be tried.

7.2 Limitations of the study

This thesis focuses only on one IoT business ecosystem around smart cities, and not each and every part of the ecosystem was interviewed due to the scope of the thesis. However, different kind of actors were interviewed so that interpretations and experiences from different points of views were able to be gained. As mentioned in section 4.3, the empirical data gathered for this thesis does not represent any objective reality in general, but rather the interviewed companies and the interviewee's subjective experiences of reality and the ways their companies are handling things. Also, the structure of the ecosystem might be slightly different if researched in another environment where also another city would be part of the ecosystem. That being said, the results of this study cannot be generally applied in other similar ecosystems. However, this thesis gives valuable information on different marketing techniques used in this particular IoT business ecosystem and among the ecosystem players. The researched marketing techniques, their importance, and levels of interactivity can be applied in other companies working in the field of IoT, and possibly in other technology industries as well.

7.3 Suggestions for further research

One clear suggestion for further research is focusing on the sustainability factor of IoT in smart cities. The theme was covered only a little during this thesis but gained wide interest among many interviewees and raised a high interest due to its

importance just now when environmental concerns are in a very high level because of a growing population and people living beyond their means.

A second suggestion for further research is related to interactive marketing and measuring its effectiveness in business marketing in more details. In the IoT industry, but in other industries too. Quantitative research on how different techniques are reaching their audience in a wider scope would be worth researching.

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ATTACHMENTS

Questions for partner & customer interviews:

1. Background information: Tell me something about you. Who are you and how long have you been in business and working for the company? What does the company do, especially IoT and smart city related projects?
2. Smart cities and IoT: How would you describe smart city? What is the role of IoT?
3. IoT-based smart city ecosystems: Who are the key partners/players in your company's ecosystem? What type of players?
4. IoT-based smart city ecosystems: How long have you been working with Wirepas? What are the advantages of working together with Wirepas, being part of the ecosystem?
5. How do you think B2B marketing has changed during the past years?
6. In general, from your perspective what are the most efficient B2B marketing channels or tactics in your industry?
7. What are the most efficient channels or techniques your company is using? How about least efficient?
8. How would you describe interactive marketing? Do you think it's efficient and does it work in B2B?

Questions for employees:

1. Background information: Tell me something about you. Who are you and how long have you been in business and working for Wirepas?
2. Smart cities and IoT: How would you describe smart city? What is the role of IoT?
3. IoT-based smart city ecosystems: Tell me something about Wirepas ecosystem (smart city perspective). What kind of companies are taking part? What value they are bringing?
4. What is the value that Wirepas can bring in the ecosystem of developing smart cities?
5. How do you think B2B marketing has changed during the past years?
6. In general, from your perspective what are the most efficient marketing channels or tactics in B2B?
7. What are the most efficient channels or tactics your company is using? How about least efficient?

8. How would you describe interactive marketing? Do you think it's efficient and does it work in B2B?

Questions for city representative:

1. Background information: Tell me something about you. Who are you and how long have you been working with IoT and smart cities? Tell me about Smart Tampere project?
2. How would you describe smart city?
3. What is the role of massive IoT in developing smart cities?
4. Why do we need smart cities?
5. What are the challenges?
6. IoT-based smart city ecosystems: What kind of companies and organizations are taking part? Smart city ecosystem from IoT perspective?
7. Cooperation with Wirepas: how long have you been working with Wirepas? What are the advantages of working together with Wirepas?
8. What raised your interest in Wirepas? How did you hear about Wirepas the first time?
9. Decision making process in cities: Who decides what type of companies are taking part?